

## School Plant and Equipment

Reviews the literature from April 1938 to July 1941. Earlier literature was reviewed in Vol. VIII, No. 4; Vol. V, No. 4; Vol. II, No. 5.

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## INTRODUCTION

**T**HIS IS THE FOURTH NUMBER of the REVIEW OF EDUCATIONAL RESEARCH which deals with the school plant and equipment. The first number was issued in December 1932; the second, in October 1935; and the third, in October 1938.

It is difficult to identify and choose true research in this field. An attempt has been made in this number of the REVIEW to include material which seems to reflect the essential characteristics of research and also material which seems to have real practical value and which raises problems for further study.

Several differences between the chapter classifications of this number and the one issued in October 1938 will be observed. Subjects on which chapters were included in the 1938 number but do not appear in this number are "Equipment, Apparatus, and Supplies"; "Foreign School Buildings"; "Plant Development for Higher Education, Including Junior Colleges"; "Pupil Transportation Equipment"; and "Status of Research in the School Plant Field." These chapters were omitted in part because it seemed to the Committee that there was not enough new material to warrant including such chapters, and in part because the present chapter organization seemed somewhat more functional than the organization of the previous issue. Possibly in the next issue some of the topics which were included in the 1938 issue but were omitted in this number should be treated again.

The present issue contains chapters on the following topics which have not been previously treated in separate chapters: "The Social Significance of School Plants"; "Some Effects of the Defense Program on School Plants"; "Educational Designing"; "The Legal Aspects of Planning and Constructing School Buildings"; "Furniture and Equipment"; "School Building Bonds"; and "Trends in Construction of School Buildings."

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# **PART I**

## ***School Plant and Society***

### **CHAPTER I**

#### **Social Significance of School Plants<sup>1</sup>**

**WARD I. MILLER**

A REVIEW OF THE MATERIAL available shows that the studies made in this field during the past three years are based largely on current practices and opinions rather than on actual research. Many writers deal with isolated situations only. Reports indicate that important changes in school plant planning are taking place in response to altered social conditions; but little evidence is to be found of thorough investigation back of much of the planning that is being done.

Several outstanding contributions have been made during the past three years. Among these are the Connecticut *School Building Code* (14), *The School Building Needs of Freeport, Long Island* (23), *School Building Portfolio A* (22), *A Rural Area in South Central South Carolina* (31).

#### **Changing Educational Psychology and Philosophy**

Engelhardt (17) pointed out the direct relation existing between the newer educational psychology and the school plant. He found that the acceptance of the organismic as opposed to the atomistic psychology has had a marked influence upon plant planning, and that plant development at the present time is based upon a more comprehensive program of education than formerly. In another study (22) Engelhardt presented a checklist for designing elementary-school classrooms based upon the latest research dealing with child development which took into account physical, social, emotional, and intellectual growth. Nichols (44) showed how the school plant should be arranged to contribute to the integration of the pupil's learning. Broome (9) planned the building to permit "learning by doing" and to provide for activities of many kinds. He listed factors in the education of elementary pupils of significance to architects and to those engaged in planning buildings. Garber (32) emphasized the relation of color to the emotional reactions of the individual and presented data showing the color scheme desirable in school buildings. Holmes (34) also emphasized the importance of color and illustrated how its proper use in tile and linoleum contributes to the mental and emotional development of the child. The Connecticut *School Building Code* (14) likewise stressed the importance of color in the educational program.

<sup>1</sup> Bibliography for this chapter begins on page 148.

### **Broader Concept of the Educational Program**

Fulcomer (31) analyzed seven objectives he found common to the programs of twenty-two selected communities and showed their influence on school plants. These he listed as (a) encouragement of cooperative effort; (b) development of a "live at home" program; (c) guidance in vocational training; (d) improvement of health education and medical service; (e) preservation of local crafts and industries; (f) provision of recreational facilities to serve all ages and interests; (g) provision of a literacy program emphasizing certain values. Nichols (44) described the manner in which the core curriculum, progressive education, and the integrated program have changed the arrangement and structure of the plant. He presented a "Table of Affinities" which graphically illustrated the relationship that should be developed between units of the building.

Coleman and Opperman (13) described the new vocational and adult school in a midwestern city and presented plans of the building, illustrating the manner in which the vocational needs of the people influenced the type of construction. Horn (36) defined functional planning as "planning for a purpose" and gave many examples of such planning in building programs. Broome (9) showed how the new community school has been planned to utilize local resources and pointed out significant departures in the arrangement of building and grounds. Bennett (5) indicated the changes in classroom seating necessary to meet the trend toward democratic educational practice. Engelhardt (17) advocated the organization of the educational system into four units. The unit for the nursery, kindergarten, and primary children might be called "The Home School Unit." The schools for elementary children might be called "The Neighborhood Elementary School." Those for the intermediate grades might be called "The Community Intermediate School," while the schools which would include the upper two years of the present high school and the two years of junior college might be called "The Regional Educational Center" or "The Youth Center." This plan was recommended in the surveys of the schools of St. Louis and Pittsburgh.

Engelhardt and Engelhardt (24) classified adult activities into five groups, each of which is affecting school plant planning: (a) socio-civic-economic problems; (b) activities related to their homes, home life, personal living; (c) recreation and relaxation; (d) vocational adjustment, readjustment, and advancement; (e) need for functional tools for participation in our society. The Educational Policies Commission in its study (43) of selected high schools found that the introduction of democratic practices in administration and teaching was materially affecting the school plant.

### **Development of the Community School**

Fulcomer (31) reviewed "the need for community education centers arising from the common problems facing secondary-school students and

adults," and reported five areas of community development that could be served by prefabricated units. He listed also the areas of adult education in which public-school buildings could be effectively used. Engelhardt and Engelhardt (24) placed the school at the center of community living and showed how the school plant may be planned to serve community needs. Engelhardt (20) defined the community school in terms of the service it can render. Clapp, in a comprehensive study (12), showed how one community was rehabilitated through its schools. Local resources and needs were made the bases for planning the educational program, and community activities were analyzed. Everett and his co-authors, writing for the Society for Curriculum Study (28), described the manner in which certain communities have adapted their school building programs to meet local conditions. They showed how buildings have been designed to provide training suited to each area, whether it is urban or rural. Their conclusions were based on comprehensive surveys of the regions studied. The technics that should be employed in making community surveys were also carefully analyzed. Emphasis was placed upon integration of the activities of the school with those of the community which it serves.

In the Seventeenth Yearbook (3) of the American Association of School Administrators, three principles of schoolhouse planning were presented: flexibility, multiple supervision, and multiple use of space. The committee stressed the importance of planning the school plant so that it may be used for community activities as well as for the education of boys and girls. Twelve trends in building construction were presented, each of which has emerged from efforts to adapt the school plant to the communities supporting it.

### Social Changes

Several studies dealt with the effect of certain social changes upon education and the school plant. They included investigations of shifts of population, birth-rate decline, economic conditions, urban decentralization, community rehabilitation, and reconstruction of rural life. Carr (11) presented three major trends in population growth that have direct influence upon school building programs and plant planning: (a) a change away from the rapid population growth of earlier decades and toward a stationary or possibly a decreasing population within relatively few years; (b) general movement of the population away from farms; (c) decline of the proportion of the population under nineteen years of age with an increase in the proportion over forty-five years of age. School building programs of the future will be conditioned by (a) continuing pressure of the population above the elementary school and demand for school services at successfully higher age levels, and (b) new programs and procedures adapted to the needs and expressed desires of persons of all ages. Specific conclusions were drawn with reference to the elementary and secondary schools as well as to colleges and universities.

Cartwright, in his introduction to Engelhardt and Engelhardt (24), emphasized the effect of changes in population on plant planning, as did also the authors of this important study. Engelhardt (23) in the survey of the schools of Freeport, Long Island, New York, showed how population changes have altered the building program in this community. The same method was used in the study (25) of the South Kingstown, Rhode Island, system. This factor was also emphasized in Engelhardt's list (19) of social factors affecting building programs, namely, population changes, urban decentralization, community rehabilitation, and educational programs for handicapped children. Fulcomer (31) and Moehlman (41) likewise found that population changes have altered materially school plant construction and operation.

Engelhardt and Engelhardt (24) determined that important changes in school plant planning and construction were necessary if the needs of out-of-school, unemployed youth and adults were to be served. They cited examples of building programs designed to take care of increased enrolment and other important changes in modern secondary-school student bodies. Fulcomer (31) showed how the need for guidance of youth and adults in vocational training has changed the equipment of school shops.

In the surveys mentioned, emphasis was placed upon the need for accurate information regarding a community and its youth before those responsible can proceed in the development of a building program. Engelhardt and Engelhardt (24) pointed out the changes that have been brought about because of urban decentralization. Loss of students and the changed character of city communities, as well as new developments in suburban areas, were shown to affect markedly particular school building programs. Both Engelhardt and Fulcomer in the studies cited above presented important data regarding the types of schools developed in communities rehabilitated in recent years. Clapp (12) showed how one school program was developed from the economic and social needs of a particular region.

Important changes in the school building programs of rural areas were reviewed by several writers. Bursch and Early (10) analyzed the conditions found in rural communities and schools in California, and showed how these have affected plant planning. Broady and Stoneman (8) found how consolidation of rural districts resulted in the development of the twelve-grade school building designed for multiple service. Niles (45), in his study of 25,000 WPA school projects, found that "the trend has been definitely toward the building of consolidated schools to replace . . . one room schools." In an outstanding survey of local school units in ten states, Alves (2) determined the factors which have affected the organization of local units. He presented valuable data regarding the number, size, and standards of rural schools in the states studied and proposed important changes in school plant planning. Seven specific

procedures were recommended. Holy (35) made a similar study in Ohio as did Credle (16) in North Carolina.

### Planning School Plants for Social Purposes

Significant studies made recently emphasized the need for community service and the determination of educational objectives prior to the actual designing of sites and buildings by the architect. The Connecticut *School Building Code* (14) presented eight serious errors found too commonly in plant planning, two of which are pertinent to this study, namely, commencing the design of the building before educational and community needs have been clearly determined in detail, and undertaking a building project in the absence of a comprehensive and well-defined future building program. The survey has become recognized as one element of good school planning. The need for comprehensive building programs rather than isolated projects was suggested in a number of important studies.

Engelhardt and Mort (25) presented an example of an accurate and detailed community survey, and developed information sheets for parents, other citizens, and teachers. Zisman (56) showed how one community carefully analyzed its needs before planning its vocational plant.

The Connecticut *School Building Code* (14) found seven specific steps to be necessary in the conduct of a building program. Engelhardt and associates (22) prepared an extensive checklist for elementary schools, together with plans of classrooms selected from each state. Each plate carried a floor plan, an elevation, and a detailed drawing of special features of each classroom, or their equivalent. Other portfolios are in process of preparation which will deal with secondary-school classrooms and with special rooms.

Engelhardt compiled also (21) checklists covering all phases of plant planning—sites, equipment, instructional units, and so forth—which were prepared by his students under his direction over the period 1930-1941. The working drawings and detail of material presented should prove of great value to boards of education, administrators, and architects. Fulcomer (31), Clapp (12), and Everett (28) studied specific communities and reported the planning back of the school plants visited. Long-range planning was described by Miller (40), Bursch and Early (10), and Haydis (33), and examples presented of outstanding building programs.

### Cooperative Planning

In recognition of the social significance of the school plant, cooperative planning was reported in several important studies. Local projects were found to be directly related to state and national programs. Niles (45) reported many instances of cooperation of local school units with other governmental agencies. Skinner (51) showed how effective the cooperative planning of governmental agencies can be. Long (39) pointed out

the necessity for long-range planning, especially in relation to federal aid. In his comprehensive survey, Fulcomer (31) described the school building programs cooperatively developed in the communities studied. Covert (15) showed how the huge program of school construction planned in Pennsylvania will be coordinated between local and state agencies. Engelhardt (17) also showed the need for coordination of school plant planning and city planning.

The *American School and University* in its thirteenth annual edition (4) brought up to date its survey of state departments and showed the part each of the forty-eight commonwealths is prepared to play in school building programs. The state of Washington (55) reported a thorough study of its common schools and presented important recommendations for greater adaptation of school plants to community needs. Haydis (33) made the same type of investigation in California.

### Changing Standards To Meet Social Demands

A review of the research carried on during the past three years indicates that standards of school plant construction are changing in response to social requirements. Zisman (56) advocated that the buildings described should not last longer than the life of the bond issue. Fulcomer (31) and Abramovitz (1) found that beauty in the school plant has an important influence on community life.

Accessibility was stressed by Coleman and Opperman (13) and by Engelhardt and Engelhardt (24). Adaptation of the school program to the changing life of the community was surveyed by Mort and Cornell (42) in an important study of the schools of Pennsylvania. Nine adaptations were measured, each of which had important implications for the school plant. Alves (2) presented data concerning the schools of Tennessee in relation to this standard. The Engelhardts likewise stressed adaptability, together with flexibility. All of these investigators emphasized the functional character of the modern school plant. It must be designed to perform efficiently the purposes for which it was developed. Each part must make its specific contribution toward the common end. Engelhardt, in his portfolio (22) of elementary classrooms, presented many examples of functional planning. Fulcomer (31) likewise showed how a number of communities had planned their school plants to serve the needs determined through surveys made previously. Coleman and Opperman (13) illustrated the manner in which a building may be designed to care for the vocational needs of a city.

### Sites and Community Needs

The *Connecticut School Building Code* (14) established standards for school sites in relation to community needs as well as to those of the regular educational program. The use of school grounds for community recreation was strongly recommended, and should be included in planning



the program. Engelhardt and Engelhardt (24) presented working drawings that indicated the manner in which school grounds may be planned and developed to serve effectively educational, social, recreational, and cultural purposes. They found that the most desirable sites for community schools should include from twenty-five to one hundred acres. They presented standards regarding area, parking spaces, landscaping, play fields, water areas, picnic grounds, natural theaters, nature crafts, gardens, and farms. Broome (9) also studied the site as a community resource. Strippling (53) developed in an unusual manner the site for a large high school in one of the southern cities. Bursch and Early (10) studied sites for rural schools in California and showed the possibilities of intelligent planning. Zisman (56) described the program of site development as worked out for a large consolidated school in Texas.

### Planning Units of the Building for Community Purposes

A new term has found its way into the literature dealing with school plant planning. Authorities in this field have employed the term "unit" or "suite" when speaking of the section of a building devoted to particular uses. The Connecticut *School Building Code* (14) presented standards for the "art unit," the "gymnasium unit," and the "shop unit." Those units most commonly used for community purposes were found to be the auditorium, gymnasium, cafeteria, library, locker rooms, recreation field, and the health service units. In planning for use of the building for adult education, convenient access should be provided for the shop unit, the homemaking unit, the commercial unit, the science laboratories, the music unit, and the art unit.

Engelhardt (21) developed plans of these units to care for forums, discussion groups, conferences, dramatics, art and music centers, as well as for the subjects commonly taught in the regular school program. Engelhardt and Engelhardt (24) studied the entire school plant from the viewpoint of community needs and services. A valuable compilation was made by the Office of Education (29) covering the planning of rooms for certain activities to be undertaken by the community high school. The areas of activities studied were the exact sciences, the social studies, the fine arts, libraries, gymnasiums, and play areas. Recommendations were presented covering space, equipment, and orientation. Fulcomer (31) included no working drawings but critically analyzed the facilities required to serve community needs.

Reed (48) pointed out that "the auditorium has become the focal point, a center of interest for the entire community as well as an important factor in its civil life." Viles (54) recommended placing auditoriums and gymnasiums near or at the ground level to facilitate handling large numbers of people. The Connecticut *School Building Code* (14) recommended that the requirements of the school program and the nature and extent of community use of the auditorium should determine its seating capacity.

The auditorium unit as conceived by Engelhardt and Engelhardt (24) includes workshops and laboratories for use in work associated with the stage. These authors presented a much broader concept of the auditorium as a part of the school plant than has been commonly expressed. The shop, homemaking, and recreational units likewise were planned in terms of functional arrangement, use, and location. A "suite" of laboratories comprised these areas, each designed to serve specific purposes. A checklist for secondary-school shops prepared by Peterson and Bartholomew (47) was designed to include standards for community use of these facilities. Palmer (46) developed plans for homemaking units which included all types of rooms found in the average American home.

One of the important factors in the complete utilization of the school plant is that of the transportation of pupils. It is of great significance in a study of social services provided by the school plant. A comprehensive review of transportation problems and trends was reported by Lambert (37).

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## CHAPTER II

### Procedures for Determining School Plant Needs in Social Terms<sup>1</sup>

JOHN SHARP WARREN and JOSEPH M. LEPS

IN PREVIOUS ISSUES OF THIS REVIEW, subjects related to the topic of this chapter have been treated. Smith, in the December 1932 REVIEW, reported on the survey preliminary to a school building program. Wilson, in the October 1935 issue, reported on the technics for determining housing requirements in elementary, junior, and senior high schools, and Arnold, in the October 1938 issue, treated the technics of school building surveys. The topic of this chapter is more specific. Comprehensive discussions of technics and procedures for determining school plant needs appeared in Engelhardt and Engelhardt's *Planning School Building Programs* and in Moehlman's *School Plant Program*. Since April 1938 some new practices have appeared in literature.

#### Community Analysis

A searching community analysis is thoroughly in line with *The Purposes of Education in American Democracy* (46) and more specifically is it in accord with the objectives of education as stated by this commission (46: 45-50). Education can fulfil its functions only to the extent that educational and community leaders are aware of the needs of all the people in the community. Goodykoontz (30) stressed the importance of the community as to size, location, history, people, making a living, community organization and government, health, recreational and cultural opportunities, housing, and welfare services. Brunner (5) emphasized a knowledge of the population, origins and culture, economic status, health, recreation, and housing. He gave the sources for many data, stressed the importance of local organizations, and showed the possibilities of the social survey. Colcord (11) gave a comprehensive outline for making a survey of a community to determine its provisions for health, education, safety, and welfare. Engelhardt and Engelhardt (19) showed the importance of studying the needs of all the people of the community and then constructing the community school to serve these needs. Engelhardt (18) showed that volumes on city planning had failed to give due consideration to school building needs. Engelhardt (18) showed that school plant needs must be reconsidered in the light of other community factors.

Thorndike (62) rated 310 American cities with populations above 30,000 (1930 Census) on 297 recorded traits. Fifteen of the cities were dropped because of incomplete data. Since he was interested in measuring "the

<sup>1</sup> Bibliography for this chapter begins on page 153.

goodness of life for good people in a city," he selected thirty-seven traits which, in combination, he believed had significance as an index of "goodness," giving each trait a weighted value. He then rated the cities according to their G score (quality of goodness) and ranked them from highest to lowest. By the use of correlations he determined the factors which influenced the G scores of cities. He found that personal income and personal qualities of the citizens accounted for about 85 percent of the differences between cities. He estimated that if perfect measures of every fact about these cities and their inhabitants were available, the differences among the 295 cities in the goodness of life for good people would be attributable to these factors (66: 117): about 60 percent to differences in the mental and moral qualities of the populations; about 3 percent to differences in their physical health and energy; about 25 percent to differences in their incomes; about 2 percent to differences in the works of previous generations (other than giving birth and training to the present generation); about 5 percent to differences in the work of government; about 1 percent to differences in homogeneity of race and culture; and about 4 percent to causes at present unknown. He advocated improving cities by "more good people"—high birth-rates of the people with the best qualities, better education, and less dependence on political reform. The work showed the limitations of formal statistical technics in dealing with social data, but undoubtedly educators will find these technics fruitful in making an analysis of their own city.

Thorndike (63) followed this study by an analysis of 144 cities with populations between 20,000 and 30,000, using the same sources of facts and the same technics.

The survey of the Pittsburgh public schools (59) was the first school survey to use technics similar to those used by Thorndike (62). The Pittsburgh Survey developed indices for testing variation in school plant needs, and applied them to the environmental and social conditions of each of the 188 census tracts in the city of Pittsburgh. Thirty-eight factors were used in making the indices, with weightings being given by the survey staff. Some of the conclusions were that the movement of population out of areas which have less desirable environments is a slow process; school buildings and educational facilities are poor in these sections since they are old sections of the city; the poorest environmental sections are most dependent upon education; such areas must be given the best of educational facilities including adequate buildings and sites; and in the light of the findings it is definitely undesirable from the point of view of either economy or efficiency to standardize school building design, since buildings must be designed to meet the specific needs of each school neighborhood.

Engelhardt (24) pursued the problem as revealed in the Pittsburgh Survey (59: 439-44) still further. He found that neighborhoods with poorest environmental conditions had the poorest school facilities and the most inadequate playgrounds; the poorest districts had almost twice as

many children of school age as the best neighborhood; but in 1939, the number of high-school graduates from the poorest was only half that of the best, indicating a serious problem in equalization of educational opportunity at the secondary-school levels; that the population density in the poorest area was three times as great as in the best area; and that health conditions were much worse in the poorest area than in the best area. For example, diphtheria mortality in 1934 was four times as great in the poorest area as in the best area, and the infant death-rate was twice as high. Variations in economic levels between poorest and best areas showed a ratio of seven times for average monthly rent, ten times for number of passenger cars purchased, and thirty times for proportion of overcrowded dwellings.

Comparisons of the enrolment of adults in evening classes were made with the environmental indices. These findings were: (a) neighborhoods having extremely favorable environmental and social conditions were not represented in the adult classes; (b) in neighborhoods with very poor environmental and social conditions a large proportion of the adult population attended both the vocational and recreational programs; (c) the neighborhoods which fell in the median group showed the greatest demand for cultural courses. This group also developed heavy attendance in the recreational programs.

The Department of Reference and Research, Board of Education, Newark, N. J., recently completed a community analysis for use in educational planning (47). The technics employed were similar to those used in (30) and (24). A notable feature of this work was the wide use of community organizations and agencies in gathering the data, under the guidance of research experts.

Some of the educational conclusions were: (a) Measures must be taken in educational planning to assure increased opportunities for children, if the city of Newark is to attract young families and thereby maintain itself as a balanced residential community. Such planning should include modernization of school buildings, greater provision for recreation, reduction of class size, expansion of educational opportunities, and improvements in curriculums and teaching. (b) Money saved through curtailment of building and recreational programs is offset to a large degree by migration of young families away from the city to find better opportunities for their children in other communities. It was found that the distribution of juvenile delinquency cases corresponded very closely with the distribution of youth fifteen to eighteen years of age not in school. Much thought should be given to the possibility of increasing educational and recreational opportunities for youth not now in school. The solution may be found in variation of high-school programs to meet the differentials in needs and wants of youth according to their social and economic status, providing wide work experiences.

Scates (55) reported three methods for deriving an economic index for census tracts or other areas in cities. These technics might profitably

be used in connection with comprehensive community analyses, such as the one reported in (47), not only for aiding in determining school plant needs but also for determining the ability of a community to pay for the school plant needed.

Many writers have advocated the social survey as an important means of determining school plant needs. Skeen (61) showed that administrators were likely to ignore the social viewpoint, but that plant needs cannot properly be determined without accurate knowledge of the whole community. He advocated the social survey embracing much the same features as (11) and (30). The job is a continuous one. Miller (40) considered long-term planning most essential to successful administration. He advocated wide use of citizen groups not only to assist in surveys but also as an advisory organization on educational matters and as a clearing-house for information to the community. He reported (39) a satisfactory and successful procedure used on his own city which was comprised of (a) publicity showing needs for a survey, and (b) study of community plant needs. An organization was set up, including representation from the state planning commission, city council, city planning commission, board of commerce, other community organizations, principals, teachers, and supervisors, aided by an educational consultant from the state university; (c) curriculum study under a curriculum director—teachers acted as a planning and coordinating council, with committees from industry, citizens, and pupils; (d) then followed the planning of the new high-school plant to fit community needs; (e) the public was informed by three committees of twelve members each, on means and methods of financing, on plant needs, and on student education and welfare. Wide community participation was an educational experience of the highest order for the entire community, resulting in a wider vision of education.

Zisman (68) reported the experiences of another community which considered the planning and construction of its school plant as being the most important responsibility of the citizens of the community. Malan (36) reported the experiences of a class in Indiana State Teachers College, studying the community from which the pupils of the million-dollar laboratory school came.

Fulmer (28) wrote up the findings of an analytical study of a rural school area which covered 115 square miles, composing ten school districts in western Picking County, South Carolina. Fulmer followed with a study (29) of another rural area in South Carolina, using the same procedure. The findings were quite similar, further emphasizing the need for a dynamic, functional educational program in solving the mammoth problems in these rural areas. The school plant must be constructed to serve the needs of all the people, both young and old. The improvement of rural education thru consolidation and other reorganization of school districts in order to serve the whole population better was recognized in (2, 21, 34, 45, 52). The National Council on Schoolhouse Construction (44: 81-82) emphasized adequate sites for both urban and rural schools



if the school plant is to serve modern educational needs. A new procedure for using sites for wide, meaningful work experience was suggested in (21).

The St. Louis Survey (60), the Pittsburgh Survey (59), and other studies (2: 30-31; 1; 9; 14; 17; 19; 21; 22; 25; 27; 41; 52) recommended a wider and more functional curriculum. They advocated providing a school plant which would adequately meet the needs of all ages in the community. Such wide uses of the schools as true community centers will cause education to become a powerful agency for the "good life" in America. Clapp (9), Engelhardt and Engelhardt (19), Fulcomer (27), Mitchell (41), O'Leary (49), and Engelhardt (14) have described community centered schools which meet the needs of all the people to whom the schools belong.

### **Housing Conditions and Their Relation to School Plants**

Education is greatly affected by housing conditions. Slum areas create many anti-social problems which educators must attack and aid in solving. The Pittsburgh Survey (59) was the first attempt, in a school survey, to analyze the problem. It was found that the poorest housed sections of the city had the poorest school facilities, including unsatisfactory playgrounds. This survey advocated the best of school facilities in the poorly housed areas. The Pittsburgh Survey also indicated a close relation between housing and the type of education which should be offered. The studies by Fulcomer (28, 29) indicated that the poorer the type of houses and home conditions, the more the community becomes dependent upon education. In Pittsburgh it was suggested that it might even be necessary and desirable to establish schools and camping grounds in the open country for pupils from the slum areas. Providing better school plants and better housing can undoubtedly save great expense to society in preventing crime. Most youth would prefer a good school with ample provisions for recreation as his headquarters to the "den" where he often starts on his road to crime. Providing superior school facilities for a neighborhood will do more good if the school is widely used as a community center for both children and adults.

Perry (50), Heydecker and Shatts (32), Engelhardt and Engelhardt (19), and Engelhardt (18, 15) have shown the necessity of correlating city planning with school plant planning. Perry has long insisted that the best way to plan a neighborhood is around an elementary school, with its plant facilities and provisions for a community center. Flanders (26) also reported a close relation between low-rent housing and educational problems. Engelhardt (23) unexpectedly found that home ownership contributed to child migration in Pittsburgh. He did not profess to know the reason for this, but suggested that it might have been due to the depression or changing economic status of the family. Wenzel (65) proposed a plan for elementary-school facilities in certain low-rent housing projects in Pittsburgh. Thorndike (63) was so convinced that home ownership was

desirable that he said, "The leaders in a community may safely encourage home ownership almost without reservation." Home ownership depends on foresight and prudence rather than income (63: 61). Buttenheim (6) suggested some of the things that educators might do about housing. Clark (10), Mason (37), Cary (8), and Wood (67) insisted that housing should be a part of the curriculum from the kindergarten to the university.

### **Residential Saturation of Communities**

A comprehensive community analysis should include a study of residential saturation. The Pittsburgh Survey (59) and the study made by the Department of Reference and Research, Board of Education, Newark (47), considered the density of population in studying the environmental conditions of Pittsburgh and Newark. Thorndike (62) and (63) also considered density of population to be an important factor in determining the "goodness" of a city. Engelhardt and graduate students showed the educational changes taking place in a community as residential saturation increased (20).

### **Effect of Changes in Population**

The planner of school plants needs to know much more than the number of pupils of the various age groups for whom facilities must be provided. He must analyze the social and economic forces and other factors which determine the number, race, and condition of the children and adults to be served, the environment which the school plant is supplementing, and further, how the school plant and program may transform that community into a more satisfactory living space. Engelhardt (15, 17), Engelhardt and Engelhardt (19), Fulcomer (27), and others developed the subject of functional planning in terms of present and projected needs for community betterment.

Carr stated that the demand for funds for plant facilities for elementary schools would not decrease in proportion to the child population due to such factors as the tendency to lessen pupil-teacher ratio, the inclusion of provisions for nursery schools and health services in an expanding school program, wider community use of school facilities, the shifting of residences within cities—from urban to suburban areas and between sections of the country. Carr (7), Baker (3), and Russell (54) found that the secondary schools are likely to maintain their attendance levels for some years longer. New buildings adapted to a broader secondary-school program will be needed. School programs and plants adapted to the needs of all the children and the community will raise the ratio of the school enrolment to the total school age population. Harvey (31) listed several factors to explain the tardy response of school enrolment to population shifts. A study under the direction of the National Resources Committee presented significant data in regard to population trends and discussed



major problems related to human resources in a report published in 1938 as *The Problems of a Changing Population* (64). Comprehensive summaries of population trends and studies of their implications for child welfare, public health, social security, and education were made before the Eighteenth Annual Conference of the Milbank Memorial Fund held on April 2 and 3, 1940, and later published (38).

Many studies based on census facts have stressed the implications for education in the wide disparity in the distribution of children of school age and the ability to furnish educational advantages. Smith (57) noted that the standard of living and birth-rate were in inverse ratio. Newton Edwards (12) found that our national educational policy should be reshaped in the light of the fact that high fertility has been co-existent with low planes of living, restricted income, low cultural and intellectual status, and inadequate educational facilities. Whelpton (66) stated that the 1940 Census indicates that the slowing up of population growth is not affecting the schools serving rural areas. The rural growth actually rose during the first half of the past decade, although the increase was far from uniform throughout the country.

*Mobility and migration*—Baker (3) noted that the uncertainty of our knowledge of where people will live, associated with prosperity and depression cycles, and the increase in the relative percent of the teen age population in the secondary schools, require further study in order to anticipate shifts and furnish a meaningful program to all youth. The mobility of our population both within and between school districts, cities, and states offers problems in the provision of building facilities and in supplementing the educative and miseducative features of the environment for children up-rooted from stable homes or continually moving from place to place. The survey of the schools of the Miami area (42) dealt with the problem of seasonal fluctuations in enrolment in schools serving tourist families. Kirkendall (35) discussed the problems of the changing enrolment in boom towns and the effect of roving upon the children. An editorial in the *Elementary School Journal* (13) stated that the largest absolute increase in population comes from the groups of inferior economic resources. The fact that the reservoir of future population of cities and industrial regions is to be found in areas where incomes are meager and the load of dependent children on producers is twice that in more favored regions is of social significance, not only in relation to the rights of the children in these areas to educational opportunities but also to the areas in which they will live as citizens and producers.

*Increasing age*—Ogburn (48), Smith (57), and Israeli (33) commented on the psychological changes which may characterize a population with an increasing ratio of elderly people to the total population. Smith (56) stated that any expansion based upon "booster" psychology is out of date. Rapid increases in real estate values generally can no longer be expected. The tone of the population is likely to become more conservative. The average age of workers will increase. Technological changes and variations

in consumption will make it necessary to provide for retraining of workers whose occupations become obsolete. Many will wish educational opportunities for cultural and civic as well as vocational improvement. Russell (54) predicted that a greater percent of the population would attend school a longer period of time and that the quality of the school product would improve.

### Expanding Needs for Education

Engelhardt (18) stated that the effect of the decreasing birth-rate would not be expressed in fewer schoolhouses but in educational buildings being adapted to the population which exists, and which, "in all stages of life, will feel the necessity of educational growth." The activities of the school, the city, and the other service agencies should be planned together upon the basis of demographic and sociological studies to provide school, park, and playground centers for community needs.

Smith (57) was among the number who commented upon the necessity for social institutions to concern themselves with the inter-relationships of the newer social trends—with the whole conception of social planning—because of the competition of age with youth for public funds. Israeli (33) believed that our old age population would require something more than care and sympathy. Education would be required to find something for them to do. Punke (51) felt that the schools should provide work training and experience to overcome the psychological effect of unemployment upon the morale of youth between the ages of sixteen and twenty-one. Fulcomer (27), Engelhardt and Engelhardt (19), and the report of the Kingston school survey (21) indicated ways in which high schools over the nation are being used to expand community interests and improve the goodness of life for people of every age.

Even though the general trend in the country indicates a decreasing school population, there will be individual communities, such as those in suburban and resettlement districts, in which the reverse is taking place. Engelhardt (20) interpreted the trends in such a community where metropolitan decentralization results in the influx of young families who are patrons of the elementary and junior high schools. Joyal (34) found a similar condition of growing population in an area affected by the increasing activity in the national capital. The report discussed methods for forecasting future population. The adequacy of the school program was evaluated in the light of a social analysis of the region, the withdrawals from high schools, and the study of the status of alumni of the schools.

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## CHAPTER III

### Defense Program and School Plants<sup>1</sup>

H. F. ALVES

**T**HE EXPANSION OF EXISTING and the creation of new Army, Navy, and industrial establishments, with the resulting concentration of population in hundreds of places throughout the country in carrying on activities essential to the national defense, has brought to the fore many problems of planning and providing services never before experienced by American communities. With many communities doubling in population and with the building of entirely new towns and cities, transportation facilities and the usual governmental services, if available at all, have proved to be inadequate. Many serious problems are simultaneously confronting us in connection with the provision of facilities necessary to community life. Activities of the federal government in its defense program have caused an unprecedented migration of personnel to Army, Navy, and industrial establishments. In many of the localities experiencing this defense impact, essential community services are not available. Our attention has quickly been drawn to the fact that these essential community services cannot be made available by state and local governmental entities. The federal government has found it necessary to lend its assistance.

#### Preliminary Study of School Needs

In the early stages of development of the program for national defense, the need for family housing facilities was recognized by Public Law 849 (76th Cong.) (4). This act also recognized the need for "community facilities" by a limited provision setting aside for such facilities, including schools, an amount not to exceed 3 percent of the appropriation. Senate Resolution 324 (76th Cong.) (5) called upon the Secretary of the Navy and the Secretary of War "to make a full and complete study and investigation of all school facilities at or near naval yards, Army and naval reservations, and bases at which housing programs for defense workers are being carried out or are being contemplated." Three questions were asked relative to these areas, namely, (a) whether such housing programs would necessitate additional school facilities; (b) whether the communities adjacent to or near such reservations and bases are financially able to provide such additional facilities if needed; and (c) whether the federal government should provide such additional facilities, irrespective of the financial ability of the community.

Following requests from the Secretary of the Navy and the Secretary of War for the U. S. Office of Education to make the study called for by Senate Resolution 324, plans for the study were formulated with the

<sup>1</sup> Bibliography for this chapter begins on page 166.



assistance of interested federal agencies and state departments of education. On January 21, 1941, the U. S. Commissioner of Education filed his *Report on School Needs in Defense Areas* (2, 13). This report shows that there is an imperative need in many localities for school facilities to accommodate children of personnel connected with activities essential to the National Defense Program and that many local school administrative units faced with the problem of providing immediately school plant facilities and teachers for a large number of additional children of school age are without authority to obtain through regular channels additional funds for these needs. Local school administrative units in common with other local governmental entities must conform to legal limitations regarding maximum bonded indebtedness for school purposes and the maximum local tax on property that may be levied (a) for interest on and reduction of bonded debt, and (b) for current operating expense.

Reports of estimated needs submitted to the U. S. Office of Education during the first four months of 1941 showed that the anticipated influx of personnel to be connected with activities essential to the National Defense Program was expected to bring into these areas approximately 300,000 children for whom adequate school facilities would not be available. In his official report (13) the U. S. Commissioner of Education recommended the following plan for paying the cost of school needs in defense areas:

1. For children residing on *public* property the Federal Government should bear the cost of required capital outlay and current expense except that when such property is liquidated, a pro rata part of the cost should be assumed by the local school administrative unit or units involved.

2. For children residing on *private* property *not subject to immediate taxation* the Federal Government should lend to the local school administrative unit the required funds for capital outlay and current expense that cannot be derived locally until the property in question appears on the tax rolls, except that during the non-tax-producing period the Federal Government should pay, in lieu of taxes, its pro rata part of the current expense.

The House finally adopted H. R. 4545 (7) with Senate amendments and the Senate accepted it on June 27, 1941. H. R. 4545 authorized the appropriation of \$150,000,000 for "public works," including schools, and became Public Law 137 (77th Cong.) (8) and funds to implement its provisions were made available.

### Administration of Public Law 137

Applications for federal funds authorized under the provisions of this Act<sup>2</sup> are filed by local school authorities through the regional offices of the Defense Public Works Division of the Federal Works Agency.<sup>3</sup> Priorities are set up in a region with the assistance of a committee composed of the regional directors of Defense Public Works and of the Office of Defense

<sup>2</sup> An authorization of an additional \$150,000,000 for community facilities, including schools, was provided for in Public Law 409 (14) on January 21, 1942.

<sup>3</sup> The administration of Public Laws 849, 137, and 409 is in the hands of the Federal Works administrator (1, 4, 8, 14).

Health and Welfare Services, and representatives of the National Resources Planning Board, state planning boards, and defense councils, as well as of education, health, and recreation. Applications are forwarded by the regional directors of Defense Public Works to their Washington office for final review. Applications relating to and involving requests for funds from this Act for school facilities are submitted to the U. S. Office of Education for "certificates of necessity" which serve as bases for approval or disapproval of projects applied for. Final action—approval or disapproval—is recommended by the Bureau of the Budget for the President.

### **Determining Needed School Facilities in Defense Areas**

The need for additional school facilities in defense areas is changing from day to day and thus can be known only through firsthand knowledge acquired through field work. To assist local and state educational authorities in determining the adequacy or inadequacy of existing school facilities in defense areas, the U. S. Office of Education has a staff of Senior Specialists on School Facilities working out of the offices of the twelve regional directors of *Defense Health and Welfare Services*. When visiting a local area for the purpose of determining actual school needs because of the defense impact, these representatives of the Office of Education are accompanied by representatives of state departments of education. Every possible effort is put forth in this field work to attempt to project additional physical plant facilities in accordance with current practices in the locality and in the state and in accordance with long-range plans. The ability and effort of the respective local school administrative units involved, as well as the existing legal limitations relative to assumption by these units of additional obligations for capital outlay purposes, and other similar factors are considered. Obviously this program of evaluation also takes into consideration available funds for school purposes from all regular sources. Possible state emergency aid is a factor in several states.

Within a given defense area, involving in some instances a number of local school administrative units, the inadequacies in a given unit may often be overcome by greater utilization of facilities within this unit and in adjoining units. Reassignment of pupils and rearrangements of schedules within and without a given local unit, in some instances permit the accommodation with existing facilities of an appreciable influx. Within existing legal limitations and specifications, transporting pupils to schools in adjoining local school administrative units is generally relied upon as an emergency measure by state and local school authorities.

If the aforementioned plan for greater utilization of existing facilities does not permit accommodation of all the increased enrolment, provisions by administrative units, involved in a given defense area, for increased school housing facilities are projected in terms of (a) bringing into use buildings abandoned during the recent past because of reorganization pro-



grams; (b) rented, donated, or improvised quarters; (c) alterations of existing buildings; (d) additions to present plants; and (e) construction of new buildings.

Whenever additional funds are required which cannot be made available from existing local and state sources, funds from Public Law 137 are usable on the basis of the actual need chargeable to the defense impact. In those local school administrative units in which defense family housing units have been provided with funds from Public Law 849, payments in lieu of taxes may be made during the year. Section 9 of Public Law 849 states:

The Administrator may enter into any agreement to pay annual sums in lieu of taxes to any State or political subdivision thereof, with respect to any real property acquired and held by him under this Act, including improvements thereon. The amount so paid for any year upon any such property shall not exceed the taxes that would be paid to the State or subdivision, as the case may be, upon such property if it were not exempt from taxation.

It is obvious that such payments of "annual sums in lieu of taxes" will in no instance be sufficient to provide for defense-connected children school facilities and services provided for children residing in the locality preceding the emergency. There is thus an urgent need in numerous defense areas for federal financial assistance for current operating purposes as well as for physical plant and transportation facilities.

### **Some Effects of the Defense Program on School Plants**

Early in the development of the program of activities essential to the national defense, it was recognized that there would be an acute shortage of workers required for these activities. To overcome this shortage and to prepare for anticipated needs for such workers, there was instituted more than a year ago a program for the education and training of defense workers. Public Law 146 (9, 11) makes available federal funds for carrying on in schools, colleges, and universities for the training and retraining of urgently-needed workers essential to the national defense. Federal funds are thus made available from Public Law 146 for (a) costs of instruction; (b) purchase of essential equipment; and (c) for rental of quarters required in connection with the Defense Training Program. School facilities which lend themselves to carrying on this program are being used in numerous instances 24 hours in the day. Even with this increased utilization, existing plant facilities are proving inadequate in a number of defense areas in which needed quarters cannot be rented because none are available.

In numerous instances state and local school authorities have continued to emphasize long-range planning begun years ago. This means that school plant facilities required because of the defense impact to accommodate the influx have been and are being planned with the same care as programs of expansion preceding the emergency.

One of the most difficult factors to be considered in this program relates to the temporariness or permanence of the required school plant facilities.

Whether or not these school facilities required because of the defense impact will be needed after the emergency is dependent, in part at least, upon the temporariness or permanence of defense establishments—Army, naval, and industrial. The use after the emergency of the family housing facilities now being provided by public and private capital for personnel necessary for the operation of these establishments is dependent in some areas upon the continuance of these establishments and in others upon their absorption into the locality housing program.

It is now known that if all acute needs are to be provided, additional funds will be required. Although no definite figures are available, it is estimated that not more than one-half of the acute school needs can be provided with available funds. Applications filed with the Federal Works Agency, Defense Public Works Division, indicate likely needs for funds aggregating two to three times the existing appropriation.

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Many of the materials of value in pursuing this topic are not available for general distribution. The hearings before the Congress on the several community facilities bills, and Congressional documents and reports were not printed in sufficient quantity for wide distribution and are in general out of print. The files of the U. S. Office of Education contain data on and surveys of actual school needs in defense areas and individual school administrative units affected by activities of the federal government's war effort, but these official documents *are not available* for general distribution and use. Copies of the several acts authorizing the appropriation of federal funds for community facilities, including schools, and copies of the preliminary study of school needs in the defense areas made by the U. S. Office of Education are available from the Office of Education as long as the supply lasts. The items available from this source are (2, 4, 5, 8, 11, 14).

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## PART II

### *Planning and Constructing School Buildings and Grounds*

#### CHAPTER IV

#### Architectural and Educational Designing of School Buildings

##### Section A.—Educational Designing <sup>1</sup>

W. F. CREBLE

SUPERINTENDENT F. H. GILLILAND listed a number of faults in recently constructed school buildings in his city and suggested that "if school administrators gave as much literary stress to the deficiencies of buildings as they do to successful features, school architects would be beneficently informed and the net result would be better planned buildings and a wiser selection of building materials." The line of demarcation between educational and architectural designing has always been a variable one. The *Architectural Record* (4) emphasizes, by implication at least, the passing of classic columns, gargoyles, belfries, steeples, and other useless adornments and the rather universal acceptance of "modern" architectural designs for schools. One could wish that these new types of exteriors clothed correctly educationally planned buildings. The departure in architectural design does not always connote an improvement in those functions essential to the educative process.

Paradoxical as it seems, notable gains in both educational and architectural designing have been achieved because patient and learned educators and architects have been able to make objective and scientific contributions in each other's field. Proctor (17) found countless omissions on selected plans of architects. He produced a work that has been invaluable to architects and schoolboards alike. Thoughtful architects should reread this study and consider its implications, for the indictments made, though not necessarily so directed, are really against incompetent architects. Pruett (18) found in studying the elementary-school standards for thirty-five states that over 1,700 adjectives and adverbs, such as "good," "well," "adequate," "clean," "suitable," "sufficient," and "proper," were used to define educational requirements of buildings. The implications are clear. Educators should supply the architects, not with general adjectives and adverbs, but with figures, dimensions, colors, and other definite educational requirements for school plants. They should then demand that the archi-

<sup>1</sup> Bibliography for this section begins on page 170.

tect produce plans pleasing in design and assume "all responsibility for character of materials, strength of construction, safe loads of buildings and other factors of safety." The architect should also be charged with responsibility for the mechanical equipment, including heating, ventilation, plumbing, and such other equipment features as air washers, humidifiers, electric wiring, gas pipe, vacuum cleaning, program clock, interphone system, and for grade of material, quality of fixtures, character of workmanship (17).

### Assistance from State Departments of Education

According to Barrows (5), "twenty-two State Departments of Education have staffs varying from one to nine members who give all their time to school building work, with funds allocated for that purpose." They are Alabama, Arkansas, Georgia, Minnesota, California, Kentucky, Mississippi, Connecticut, Louisiana, Missouri, Florida, Michigan, New Jersey, New York, Texas, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, and Wisconsin. In nineteen of these state departments, school building work is carried on under what is known as either a "Division of School Buildings" or a "School Building Service." In three states no specified title is given for the work except for the title of the "director" who, with the members of his staff, gives all his time to this work. While practices vary in the several states, all of them are concerned with educational designing and the functional planning of schoolhousing projects.

These "divisions" are manned by personnel trained in schoolhouse planning and educational designing, and having technical knowledge of architectural planning. Through their specialists they are able to advise and counsel with educators and architects alike. The arguments in favor of the establishment of such divisions in all state departments and large city units are many. Perhaps the southern states offer the most convincing evidence of the worthwhileness of these divisions. The majority of them had their inception through grants from the General Education Board; since the withdrawal of aid from this source, all the states have seen fit to continue them.

The National Council on Schoolhouse Construction (11) and the National Advisory Council on School Building Problems have put forth much effort to have such services established in states not having them.

### Trends in Design of Buildings

Howard Dwight Smith, (20) in the "Review of Educational Research" for October 1938, reviewed trends in both architectural and educational designing. Smith noted that "modern" designs have already made their advent. Five fairly recent magazine issues provide a reasonable diversity of examples to indicate influences and trends as to plan, arrangement, and exterior appearance. They are: *Architectural Forum* for June 1936; *Architectural Record* for June 1936, April 1937, and May 1938; and *American Architect* for April 1937. Among these issues several foreign

buildings of current interest appear. "Modern Bibliography of School Design," by Sykes, fills ten pages in the June 1936 *Architectural Record*.

The student of educational designing should read Noffsinger's *Century of Progress in Special Instructional Rooms* (16). Noffsinger closes his article with the statement that "the most outstanding difference between the school buildings of 1900 and the ones of today lies in the provision for special rooms" (16). John E. Nichols (6), supervisor of buildings and plans, Connecticut State Department of Education, definitely inter-relates the functions of educators and architects, and at the same time defines the spheres in which each should work.

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## Section B.—Trends in School Architecture and Design <sup>2</sup>

N. L. ENGELHARDT, JR.<sup>3</sup>

### Schools of Last Century

Architectural design of school buildings, in a broad sense, may be viewed as an expression of the attitude of people toward education. Changes in design over the years and variations in treatments among places reflect gross shifts in the positions which education has held in society. To be able to recognize basic alterations as contrasted to mere improvements in building design, it is almost essential for one to review the history of school architecture and to evaluate new changes in the light of new educational emphases.

Reviewing the architectural history a hundred years ago, one finds many educators of that period describing schoolhouses as shabby and neglected structures. Barnard (5) wrote:

Go where he would, in city or country, he encountered the district school-house, standing in disgraceful contrast with every other structure designed for public or domestic use. Its location, construction, furniture, and arrangements seemed intended to hinder, and not promote, to defeat and not perfect, the work which was to be carried on without and within its walls.

Mann (16), in his report of the Massachusetts Board of Education, stated that the sums expended for the erection and repair of schoolhouses "fell but little short of seven hundred thousand dollars" during the five-year period. This report went on to say that "in regard to this great change in schoolhouses it would hardly be too much to call it a revolution. . . ." In New York State at this time there were approximately 9,368 school buildings of which 7,685 were of framed wood; 446 of brick; 523 of stone; and 707 of logs. Only 1,541 of these schools had suitable playgrounds according to Young (21).

Many of the schoolhouses of about 1845 were located on the principal highways with little or no playground, and lacked shade, trees, and restful, quiet environment. Reports of the state of Connecticut indicate that classrooms were 7 feet in height, 17½ feet wide, and 18½ feet long, holding thirty children. One report stated that eighty pupils were housed in a room 19½ feet square. Another showed that sixty or seventy pupils were housed in a room 7 feet high and 17 feet square. Many of the buildings were twenty to forty years old.

In 1832 the American Institute of Instruction said that ". . . if we were called upon to name the most prominent defect in the schools of our country, that which contributes most, directly and indirectly, to retard the progress of public education, and which most loudly calls for a prompt and thorough reform, it would be the want of spacious and convenient

<sup>2</sup> Bibliography for this section begins on page 177.

<sup>3</sup> Assisted by Roger L. Downing and Andrew L. McIntosh.

schoolhouses." The schoolhouses prior to 1850 were badly located, exposed to noise and dust. They were small, badly lighted, not properly ventilated, and poorly warmed. The seats and desks were not comfortable or conveniently arranged. There were few or no blackboards, maps, or other apparatus and fixtures. There were no trees or shrubbery, no well, no sink or basin or towels, and no toilet facilities.

Barnard (5), in a book concerned primarily with the design of schoolhouses from the point of view of educational use, gave considerable emphasis to ventilation, heating, and sanitary facilities. He also recommended seats and desks to be made to fit young children and not adults. He listed apparatus which should be included in every classroom. He stated that every recitation room should be lined with blackboards. He recommended slates for every scholar, a clock, a linear measure, compass box, and "articles which the pupils can touch, see, examine, experiment with, copy on the slate or blackboard." Barnard also wished to make the schoolhouse a depository of the district library "open to teachers, children, and adults generally of the district, for reference and reading. . . ." He went on to say that "the farmer, mechanic, manufacturer, and in fine, all the inhabitants of a district, of both sexes, and in every condition and employment of life, should have books which will shed light and dignity on their several vocations, help them better to understand the history and condition of the world and country in which they live, their own nature, and their relations and duties to society, themselves and their creator."

However, the use of the schoolhouse by adults was limited to the library, as is indicated in the following: "In small villages, or populous country districts, at least two school-rooms should be provided, and as there will be other places for public meetings of various kinds, each room should be appropriated and fitted up exclusively for the use of the younger or the older pupils." In 1858, *Johonnot* (14) wrote a book which was the first real effort to apply the principles of architectural science to the construction of schoolhouses. *Johonnot* (15) broadened his efforts in 1871.

During the period immediately following the Civil War, there was a tendency toward the architectural development of schoolhouses. As *Johonnot* stated (15):

For the past few years architectural science has made rapid and decided progress. . . . Evidences of this progress may be seen in the superior elegance of the modern public edifices and private residences of our cities and villages. . . . Of all the buildings, however, the last to feel this progressive impulse were schoolhouses.

The old log school-houses can be remembered by most of the older inhabitants. It was a necessity of primitive times, and was on an equality with the dwellings of the people. A better kind of structure has succeeded it, though we find in the last report of the Superintendent of New York (1870) that one hundred and twenty log school-houses are still in existence in the Empire State.

The reports of the Superintendents of several States within the past few years, show that an improvement has gone on in many sections, indicating a genuine educational revival. And yet a large proportion of the schoolhouses in the country are but illy adapted to meet the high requirements of modern educational ideas. Even the newer and costlier houses are often built without proper knowledge of the wants and neces-



sities of the school, while a very large number of the older houses are utterly unfit for human occupancy.

The buildings to which *Johonnot* referred were of poor construction. The foundations were weak. The building materials were of the cheapest kind. The seats were without backs and often were too high to permit the feet to touch the floor. The rooms were crowded and the ceilings were low. There was no ventilation except that which was offered through small windows. In many cases there were no privies. The buildings were generally located at corners where several roads met, with no playground space except the streets even in country places where land was cheap.

These conditions led to emphasis on health, comfort, convenience, and cost. These elements were prerequisite to the proper development of an educational program, but because of their importance little was written about the design in terms of facilities for enhancement of the educational program. About this time New York State passed the law giving the right of eminent domain for school sites. This permitted the establishment of schools on the most favored sites. Recommendations were that schools have at least one acre of land. Out-buildings were recommended by *Johonnot* (15), but *Eveleth* (10) showed plans for buildings in which toilets were made an integral part of the main structure.

The architectural designs of the schoolhouses of this period were of American origin. The city schools were two and three stories in height and extremely plain on the exterior. An English writer (18) in discussing American schools stated that ". . . the architectural character is that of a detached, well-built warehouse. The architectural designs . . . are extremely plain, not particularly school-like in character, and of no special English interest. . . ."

### Early Twentieth-Century School Buildings

The latter part of the nineteenth century brought revolutionary changes in schoolhouse design. The introduction of steel for supporting members, the increase in use of brick bearing walls, central heating and ventilating plants, the advances in architectural design, and the need for larger buildings established a new era of school construction. Perhaps the most significant phase of this movement was the development of detailed plans and specifications for each individual building. Previously, standard plans were given to contractors with only the most abbreviated specifications.

In 1901, *Wheelright* (19) wrote a treatise which gives striking evidence of changes in schoolhouse architecture when comparison is made with *Johonnot's* book (15). It should be noted that many of the buildings of the early 1900's are in use today. The plans of the elementary-school buildings were quite similar in several respects. Play rooms and toilets for each sex were provided in basements. The first floor contained classrooms ranging from 25' x 32' to 28' x 37'. Invariably the assembly room was placed on the second or third floor. An office for the principal and a manual train-

ing room were sometimes provided. Fixed seats, extensive blackboard space, and a limited amount of equipment were found in the classrooms.

The high schools built in the cities during this period contained laboratories, gymnasiums, lunchrooms, assembly rooms, and auditoriums. The gymnasiums, locker rooms, and toilets were located in the basement, as was the case in the elementary school. Architectural design of many of the buildings was transmitted from the Teutonic countries and the simple colonial boxes gradually disappeared except in rural regions during the early twentieth century.

In 1921, Donovan (6) contributed to the literature of the field. Expressing a motive for school architecture, he stated:

There is nothing more impressive or hopeful in American democracy than the devotion of the people to education. . . . Unconsciously the spirit has been to represent truly this national devotion to education in the architecture of public schools.

One of the important functions of school architecture is to sell education to the public. This is accomplished by making attractive that side of education which the public sees most.

During the period 1850 to 1920, school architecture advanced from the low point of complete neglect to a high point of monumentalism. School buildings changed from small, shabby units to large, beautiful edifices, glorifying the people's devotion to education. The interior planning, however, expressed little change in educational method except, perhaps, in those elements of the schooling process associated with larger pupil population. The perfection of administrative technics for handling large schools was an important factor influencing interior planning. The suggestion of a mechanized process of education has been expressed in the not infrequent factory-like design of school buildings during the past few decades.

### Recent Developments

In the last issue of the school plant volume of this REVIEW (16), several important points were made foreshadowing the possible basic changes in school architecture. These points may roughly be divided into three categories, namely: those growing out of added responsibilities of the schools, those developing through new materials and methods of construction, and those which are created by a broad recognition of the changing place of the school in the community.

The addition of health clinics, general shops, gardens, and other activity centers represent added responsibilities and changing methods. The earthquake-proof construction of California schools, the use of plywood walls, insulation, and acoustic treatment illustrate changes brought about by new methods and materials available to architects. These changes, however, merely tend to improve and expand traditional school design. The classroom unit still remains. The exterior façade is still monumental with its columns, massive entrances, terraces, and bell towers. In some cases the so-called "modern" architect has shorn the façade of ornament, but he

has frequently retained the monumental character by distribution of masses.

Here and there throughout the country there appear signs of another basic change in school architecture. It is primarily a movement away from the monumentalism of the past four decades. People are not using their school buildings to sell their communities. The school building is being developed as a more intimate and better integrated element of the community, a place closely associated with child and adult living. It is more of a community workplace and recreation center. Location on a main highway or on a hill as a vantage point for attraction of potential citizens has been discarded in favor of sites more intimately associated with community living.

Engelhardt and Engelhardt (9) expressed this changing attitude when they said:

The modern school architecture, if it is to be an honest expression of the place of the school in present-day environment, must accept as its theme participation by all members of the community. It must express informality. The break with the past must be based on the elimination of institutionalism. Security must be expressed not by monumentalism, but rather by stimulation and attraction which bid all welcome to the school in times of need. Then, too, the truly modern style must express function, and the functions of the school are as varied as life. Flexibility of these functions to meet the needs of a dynamic society should be a vital consideration.

These changes were also reported in the *Architectural Record* (4):

In 1939 and 1940 *Architectural Record's* Building Types studies on schools reported numerous changes in school design principles which educators advocated. In teaching practice there has come to be an increasing emphasis upon laboratory methods, in even the most static subjects; and the pupil's school life is being integrated with the community—and vice-versa. Also, the past few years have introduced a need for structural economy, and it has been recognized in many parts of the country that requirements change so rapidly that the plan must be flexible, the entire plant dynamically useful.

In contrast to the architectural motive expressed by Donovan (6) twenty years ago, it is interesting to note the emphasis in a recent letter of an educator to his architect published in *Architectural Forum* (2):

All the architecture shall be a setting for childlife. Everywhere children and what they can do shall be the adornment of the structure. The building itself shall be the place of joy in living. But I must warn you. It must be a place which permits the joy in the small things of life, and in democratic living. These two things we must safeguard in children's lives. The building must not be too beautiful, lest it be a place for children to keep and not one for them to use. Its materials must be those not easily marred, and permitting some abuse. The finish and settings must form harmonious background with honest child effort and creation—not one which will make the children's work seem crude.

Above all the school must be childlike—not what adults think of children. At the same time it should be dignified, and playful, but not a playing down to children. It must be a place for living, a place for use, good hard use, for it is to be successively the home, the abiding place for a procession of thousands of children through the years. It must be warm, personal and intimate, that it shall be to each of these thousands "My school."

### Campus Plan

Harrison (13) has envisioned many basic changes in schoolhouse design—"The modern school building should be a building that invites people to enter." Engelhardt and Engelhardt (9) pointed to the "campus" or "open" plan as a design trend:

Some indication of the trend in the design of community schools is to be found in the wider acceptance of the "campus" plan. This plan calls for small separate units connected by arcades or passageways and attractively grouped. This type of arrangement is quite flexible and eliminates much of the institutional atmosphere of the large, compact structures.

Much emphasis has been given to the open plan in California. It is possible that this development has not grown so much from changing educational practice as it has from structural needs. The *Architectural Record* (3) pointed out in connection with a school at El Monte, California: "Two factors determined the choice of open plan, with departments housed in separate structures: the local soil-bearing value was very low; the buildings had to be designed to resist earthquake stresses." Engelhardt (7) recommended the campus idea and suggested that its absence is a definite limitation of the older type of school. Wright (20), in his study for his model community, Broadacre City, stated:

The school problem is solved by segregating a group of low buildings in the interior spaces of the city where the children can go without crossing traffic. The school building group includes galleries for loan collections from the museum, a concert and lecture hall, small gardens for the children in small groups and well-lighted cubicles for individual outdoor study; there is a small zoo, large pools, and green playgrounds. This group is at the very center of the model and contains at its center the higher school adapted to the segregation of students into small groups.

### Community Centers

In a comprehensive study of the use of high schools as community centers, Fulcomer (11) definitely indicated a trend in the use of school buildings by adults. Although many of the buildings analyzed by Fulcomer had some community use features, there were few which could be considered complete community centers.

Fulcomer (11) also studied PWA requests for community buildings aside from schools and found that:

With the exception of the police court and detention allocations, there is not a single facility indicated in these community building plans that is not a common feature of secondary plants. In fact, such space allocations are those most frequently represented in the plans analyzed. The provision in the secondary school building of these facilities would serve both the high school students and adults to advantage, as the discussion of the community nature of many needs of both groups has already indicated.

Engelhardt (8) has expressed one of the problems of the use of schools as community centers as follows:

There are very few communities in the United States where some integration of school and community life is not taking place. The question that each community

should raise is whether the school cannot function in the economic rehabilitation and social recreation of all its citizens, and how the community program can be best developed toward this end. The institutional character of many schools has been a barrier to widespread community and adult use. In many instances adults have so disliked the formal school program of their youth that they tend to refrain from entering school buildings again. The very atmosphere of the school is repressive to them. A discovery of the degree to which this is true in any community might well result in rethinking the existing program for the community's youth.

Hare (12) wrote on the relation of the public school to the development of the community theater.

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## Section C.—Trends in School Architecture and Design —Current Developments<sup>4</sup>

FRANCIS R. SHERER

Perhaps no decade other than the last has seen such marked advances in schoolhouse planning and design. By no means, however, have we reached a point where all current planning would find itself in accord with the ideas of a majority of the outstanding school planners in this country. If we were to point out some of the more important factors responsible for this improvement, we should mention first of all the better collaboration now given upon a project by the educator, administrator, and architect. Organizations that have made marked contributions are the National Council on Schoolhouse Construction, the National Association of Public School Business Officials, the American Association of School Administrators, and the National Advisory Council on School Building Problems. The creation of building divisions in the state departments of education has likewise proved of inestimable value in bringing about better school plants. Unfortunately, at present only twenty-two of our forty-eight states give this type of service by persons whose major interest and training are in the field of building, planning, and construction.

Perhaps no one organization has exercised greater influence on the planning and exterior design of smaller buildings than has the Julius Rosenwald Fund (8) in connection with its program for building Negro schools in the South, by means of their financial and supervisory assistance to approximately 5,000 such buildings. Much has been said and written about the effect of the Public Works Administration in the period of its financial assistance for school plants throughout the country. Although the speed, with which drawings had to be made and projects gotten under way, was such as to leave insufficient time for studied planning, the reviewing engineers at Washington wisely adopted a set of construction standards which resulted in good buildings. Although there were many errors in educational planning due to a lack of immediate knowledge on the part of those responsible for the planning and insufficient time in which to assemble the proper information, the experience will not have been too costly if it serves as a proper warning should there again be a program of federal aid. The educational journals and the architectural magazines (1, 2, 3, 11, 14) play a significant role in disseminating information for the betterment of school planning and designing (9, 15).

### Exterior Treatment and Design

The days of the construction of even a small schoolhouse by a builder without a well-studied plan have come to an end. Also nearing an end is the architect's frequent conception of a community school as something

<sup>4</sup> Bibliography for this section begins on page 180.



that must be monumental so as properly to dignify the community, and sometimes, perhaps, himself. It is interesting to note, however, that the modern influence in the exterior treatment of our school buildings is growing. The day of applied ornamentation, with the mistaken idea that beauty was being created, is fast disappearing. In large measure this is due to the fact that the more competent and highly trained architect is being employed (4). The school building of today is more apt to have its exterior simple in line and ornamentation, depending for its beauty on proper massing, proportion, materials, and color harmony.

### **Classrooms and Other Interior Design**

Code requirements and so-called standards should serve only as they are truly intended to serve, namely, to indicate minimum requirements. For example, in setting up the requirements of an elementary classroom as being 22 feet wide and 30 feet long, it was not the intention that such a size room was all that would be required. The proper interpretation would be that the room should be not less than 22 feet by 30 feet and should be as much larger as would be necessary in the light of the type of program to be carried out, the optimum size of the class, the existence in other parts of the building of special facilities for certain activities, and provision for storage of supplies and projects. The trend is toward larger classrooms, and already rooms 24 feet wide and 35 feet long have appeared for a class size of 40 (6).

More is being done about building features in the classroom which thus become a part of the school building. In elementary schools, less blackboard is being installed and an increased amount of display board. Ample storage space is provided, some enclosed with doors, others open, particularly shelving for books and projects, extending from floor to chair rail so that the children themselves, even in the kindergarten and primary classes have access to the materials. An atmosphere of warmth and cheerfulness is sought through the use of color, sufficiently varied in hue and shade so as to defeat institutional atmosphere (6, 7, 10, 12).

Interior planning has become progressively better not only in the instructional area but also in such essential factors as safety to life, health conservation, good housekeeping, and economy of operation and maintenance. A study made of many school fires and disasters has led the Building Exits Code Committee of the National Fire Protection Association to formulate a code of minimum requirements for corridors, passageways, stairs, and exits for both new and existing school buildings. The National Council on Schoolhouse Construction as a member of that committee for the past twelve years has had a hand in formulating some of the requirements to provide exits sufficient to empty school buildings promptly after an alarm of fire has been given, and to provide for construction such that buildings may be emptied without danger to life by fire, smoke, or resulting panic.

### Consideration of Operation and Maintenance

The newer buildings have been planned with more attention to the housekeeping problems. To some extent this results from an improved custodial force sufficiently articulate and progressive to make known the failures and weaknesses of the many schools that on the surface were considered to be "wonderful" but below the first floor a different story was told.

Accessibility of sink rooms, plenty of hot water, a knowledge of cleaning materials and technics, suitable materials of construction and finish, freedom from ledges, projections, and dust catchers as evidenced in the present schools make the janitorial job not only a more interesting one but result in attracting higher type persons to that field of service and make for economies in labor and cleaning supplies.

The architect plans to some extent in the light of the materials he proposes to use. In no one phase of the school plant problem has there been any more effort given toward improvements than for materials of construction and finish. In recent years many articles have been published and many meetings held at which discussions centered on this important subject; for example, the National Association of Public School Business Officials for several years has had committees engaged in long-range studies on various phases of the school plant (9). Recently they have published reports on school flooring and on playground surfacing.

Larger school systems maintaining specialized personnel for the direction and supervision of plant operation and maintenance are continuously experimenting with new materials and methods. Quite properly, the good architect is not too easily influenced by that which will make for lowest initial cost without full regard for the matter of recurring maintenance and operating costs. So, frequently it happens that an increased initial outlay would have substantially prolonged usefulness, as in the case of brass pipe for hot water lines versus galvanized steel, or in the case of excessive heat losses through poorly insulated roof decks.

Among the errors to be avoided in school planning is the tendency to copy some facility or feature of planning which is ideal for one climate but which proves to be an indefensible expenditure of money in another area where low temperatures, snow, and ice make the facility unusable most of the year. It stands to reason that school plants of differing types of construction and arrangement will best satisfy the needs of certain areas because of climatic differences.

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## CHAPTER V

### Legal Aspects of Planning and Constructing School Buildings<sup>1</sup>

S. M. BROWNELL

STATUTES OF THE FORTY-EIGHT STATES each provide the authority and limitations under which school districts and school officers may or must proceed in the planning and constructing of school buildings. These provisions may cover directly, or through power granted to school officers, such things as the designation of school sites, the approval of the site at an election, the issuance of bonds (including special procedures for the election to authorize bonds, legal debt limitations, possibly the necessity of approval by state authorities, and regulations as to the sale of bonds), selection of and contract with an architect, advertising and letting of bids, making of contracts with builders, securing statutory lien and performance bonds, payments for work done, acceptance of the building, protection of workers and the public during construction, liability for fire, theft, and other damage during construction, state approval of plans, the force of building codes, purchase of and payment for equipment, and the authority of special building committees other than boards of education. It is possible to have disputes arise around each such provision with resulting court action.

Research literature concerning these problems during the past three years is confined to one study of the "lease and option" device for avoiding constitutional limitations on the indebtedness of school districts in Kentucky for the *Kentucky Law Journal* (18), portions from two valuable contributions to the field of school law in the form of mimeographed case and legal problem books on school law (15, 16), and reports of court decisions. These reports may probably be considered research if one accepts the premise that each case in and of itself represents research.

#### Sources for Study of School Law

Hamilton's case book (15), which briefs approximately 110 cases, is of particular significance as being more than a sampling of cases in the field of school law even though it contains but few notes. Quotations from the preface will best serve to illustrate the point of view of the author.

That educational law is far behind modern educational thought is apparent. Much of the litigation affecting schools is partly the result of inadequate and antiquated school legislation and partly of the fact that school administrators do not realize the legal pitfalls inherent in their positions until they find themselves and their districts involved in litigation. . . . It is believed that the use of the cases along with any standard textbook on school law and the statutes of the states . . . will provide a

<sup>1</sup> Bibliography for this chapter begins on page 189.

more complete and well-rounded course in school law than would be possible with any other combination of materials. . . . When the continuity of the case does not suffer thereby, an effort has been made to delete as much technical discussion . . . as possible. . . . The notes to cases are designed to show how the courts work and to dissipate any idea the student may have that the law is a rigid set of rules which lead inevitably to a given conclusion. If a study of the cases does not convince the student that rules and principles of law are merely tools in the hands of the courts which are used by them to reach results which they consider desirable, this work will have failed in one of the chief purposes for which it was designed. From such a study it is hoped that the student will gain some idea of the extent to which the attitudes of courts are in accord or in conflict with modern educational thought.

Hodgdon's case and problem text in school law (16), which briefs approximately 125 cases, constitutes Part I of Educational Jurisprudence. Part II is yet to be issued. The book briefs cases, intersperses them with comments noting the educational significance of the point under discussion, and lists problems for study and discussion. The function of the book is indicated by these excerpts from page two and from the introduction, which state that the cases included deal with "the definition, philosophy, theory, and control of education; the administration of schools, teachers' rights, duties, liabilities, and administration and control of pupils, parents' and pupils' rights and duties, and textbooks."

The material in this book has been selected from leading cases in the various state courts and the United States Supreme Court. The decisions of these courts have controlled our philosophy of education. The courts have been called upon repeatedly to define the function, purpose, and philosophy of public education in the United States. In order to understand the philosophy and history of education in this country it is essential to study the judicial philosophy of the final authority to which all education must bow. . . . No matter what theories education reformers may entertain or promulgate, the courts are the final authorities to disapprove, modify or accept such theories. They will favor only those that they believe to be based on fundamental principles of public policy (16).

The *Yearbook of School Law* (9)<sup>2</sup> continues to provide a narrative topical summary of decisions of the higher courts in all states in cases involving school law. More frequent brief reviews of court decisions involving school law are provided monthly in the *American School Board Journal* under the title "School Law." These are the two major sources to which school officers and staff members can most readily turn for the gist of current court decisions of concern to the schools. *The Clearing House* likewise presents each month under the heading "School Law Review" some particular phase of school law based upon principles of law involved, problems in the field, and court decisions. During the three-year period, however, it did not include any discussions related to the planning and construction of school buildings. A similar department called "Some Recent Court Decisions" was provided in *Educational Law and Administration* (14), which ceased publication with the October

<sup>2</sup> References in the bibliography from these yearbooks appear under the name of the author contributing the chapter.

1939 issue. Other reports appeared in occasional articles dealing with some special problem of school law.

One word of caution seems desirable before presenting brief statements concerning court decisions as found in the reviews. Each case has its setting in terms of particular facts and the laws of a given state. Reviews do not have the space to give the complete details. The further compression here of findings, out of their setting, may easily give an erroneous impression concerning the general applicability of a decision which was reached because of peculiar circumstances of time, place, and specific state law.

### **Plans of Financing School Buildings**

In cases involving questions of federal aid, the courts decided that Congress had power to control local projects under the Public Works Administration since the PWA was to be considered as a whole and was justified under the general welfare provision of the Constitution (22). Courts decided that PWA regulations included in a contract did not delegate discretionary power of the board of education (22); that acceptance of a federal grant did not limit a district to sell its bonds to the federal government (22); that the offer of federal aid for the construction of a school building did not constitute a bribe, prevent a free election, or hinder the right of voters to exercise the elective franchise (23); that a given district could issue and sell bonds before a federal grant had actually been made on a proposed project (19); that an agreement by the federal government to grant funds could be considered equivalent to money in hand (23); that a local district might prudently include in a building contract the provision that on each payment to a contractor the federal government should pay its agreed percentage (22); that the legislature had power to enact a statute to allow acceptance of federal aid although it conflicted with earlier legislation, and that by the language of the act in question it clearly superseded the earlier legislation (23); that a state appropriation bill did not include federal funds because the state had no power to appropriate federal funds (8), and that a school district might turn over its entire school plant to a municipality in order to become eligible for federal aid (19).

Court action affirmed the legality of financing school buildings through a state authority in Pennsylvania (1) and bonds issued by the authority were held not to be obligations of municipalities, school districts, or counties (19). In Arkansas, legislation was declared unconstitutional which attempted to permit the state board of education to issue bonds in order to assist local school districts in constructing buildings (19). In New Mexico a contract was held constitutional and legal when a local district issued bonds for a school building in which a state teachers college was to conduct a training school without tuition to the local students (7, 8, 19).



Bonds issued by state colleges and universities which pledged student fees were declared legal, not an obligation of the state and not an increase of the state debt (3, 22, 23). In fact it was held that a college might agree to lease space in a proposed building, the rent to be paid from the annual tax levy, without creating a debt (23, 29). Also *mandamus* proceedings to force collections of fees and distribution to bond holders was declared not a suit against the state and hence might be granted (23). In the case of a municipality pledging *ad valorem* and license taxes for the payment of bonds, it was noted that legitimate operating expenses must first be paid even though bonds apparently claimed exclusive pledge of certain revenues (29).

Financing of construction through a holding company which issued bonds and erected the building under a mortgage and lease arrangement received approval and disapproval of the courts under differing circumstances (14, 19, 24, 28). Lovett (18) made this plan of financing the subject of an intensive study.

The use of funds raised for current operating expenses to finance building construction resulted in several court actions. It was held to be beyond the discretionary power of the board of education in some (2, Nov. 1939; 19), in others it was permitted (2, Aug. 1939; 29; 31), while one court held that this plan of financing was permissible only if surplus funds were used (31).

The authorization of bonds by a schoolboard without an election was held illegal under the facts of the case (28) and a board of education was held not to have power to fund anticipated revenue through bonds or warrants (13, 15, 26). However, schoolboards were held to possess a measure of discretion concerning the financing of school construction (2, July 1940; 4).

Two different actions involved counties. One held that a district in North Carolina which voluntarily constructed a schoolhouse could not demand that the county pay the cost (19). The other held that a county school district in Kentucky had no legal authority to issue bonds (20).

### Bonded Indebtedness

Discretionary powers of the board of education in issuing or retiring bonds were challenged in a variety of cases. An election was declared unnecessary where a district indebtedness would not exceed a percentage set by the statutes (19) and when more than a majority of voters signed petitions favoring a bond issue (21), but under other conditions an election was declared necessary for the issuance of bonds (28). Boards of education were held to have the power to carry on campaigns for school bond elections in one case (2, Dec. 1938). In expending the money from a bond issue, schoolboards were directed to carry out the purposes for which levied, or, as stated in the election notice and on the ballot (21), not to expend money that was derived from bonds

issued for a new building for repairs on an old one (2, Jan. 1940). Bond proceeds were declared usable for equipment where legally voted and not exceeding the statutory limit (2, Sept. 1940). In management of taxes raised for the retirement of bonds, it was ruled that the statutes left as a discretionary power of the schoolboard the disposition of any surplus (21). In another case it was held that an election was necessary to permit any other use of bond retirement tax money (21). In still another situation the board of education was held to have power to apply a tax surplus to accelerate the retirement of bonds (32). In school districts having insufficient funds collected to redeem all matured bonds, one decision reached was that the money should be applied on all bonds *pro rata* (21). Another was to the effect that the court could not compel a schoolboard to choose one method of payment when several methods were available (21). A third decision refused to compel the use of all money collected to go for bond payments on the grounds that not to provide for current expenses would be against public policy (21).

Davis (10) reported a study of school laws which indicated considerable agreement among the states as to general provisions for bond issues. There were a dozen or more suits, however, seeking interpretation of statutes governing the issuance of bonds and testing the validity of bonds. In one case the court stated that every phase of the law was material to the validity of bonds (19) while in another situation it was held that bonds would not be held invalid because of a technicality (19, 20, 24). Where there were conflicting statutes, the court was held to have power to interpret which statute governed (19). Statutory requirements which courts held essential to have bonds declared valid were: approval by a state debt commission (19); the vote of two-thirds of the actual taxpayers rather than two-thirds of those on the tax roll (21); election under the school laws rather than the general election laws (14); and the following of the statutes governing the actual population at the time of the bond issue (2, March 1939). It was held also that the validity of the bonds could not be questioned unless protest was filed within the time set by law (21); after the funds had been used in good faith for a legal purpose (21); or after judge by decree had approved them (21). Bonds for equipping a school were declared valid where legally voted and within the statutory limit (2, Sept. 1940). It was held in one case that the power to borrow granted by the statute included the power to issue bonds and pay interest (17). In other cases it was declared that the statutes determined who should vote on a bond issue (21) and that a schoolboard could not waive a statutory provision making bonds callable by issuing noncallable bonds (28).

In reference to the effect of statutory debt limits and annual expenditure limitations on the issuance of bonds, refunding bonds were stated not to represent new debts (2, March 1939; 20). Municipalities with special charters were judged to be exempt from general debt limit statutes

(19) and annual expenditure limits were held not to repeal the power to borrow unless the power was specifically repealed in the statute (17).

### **Building and Architectural Contracts**

The cases involving building and architectural contracts during the past three years emphasize the points made by Chamberlain (5), Hamilton (15), Hodgdon (16), and Webb (27) of the need for an elementary knowledge of the law of contracts by school officers and for the securing of legal advice in entering into important contracts. In cases testing their validity, contracts were declared invalid which attempted to evade the statutes (11); made orally in the face of statutory requirement for written contracts (2, March 1939); creating an indebtedness in excess of statutory limitations (12); made before funds were available contrary to statute (13); and when entered into by the superintendent without express authority from the schoolboard (2, March 1939; 2, July 1938; 26). Contracts were declared enforceable which extended beyond the services of board members (11, 12) or where funds were not available at the time (2, Nov. 1939; 2, March 1939; 12). Contracts made orally, though by statute required to be written, or otherwise illegally issued, were valid where the benefit of the contract had been accepted and used (2, Dec. 1938; 11; 28), except in one instance (2, July 1938).

An architect's contract was held valid though the cost of the proposed building would exceed the debt limit of the district (2, Aug. 1939), and an insurance contract was held to be in force when the premium was not paid, there were no written minutes of the meeting, the funds for insurance were exhausted, and the making of a premium payment would therefore have been an invalid charge (2, Nov. 1939; 29). The courts were called upon to decide what was included in the terms of contracts in several instances (2, May 1941; 11; 12), and in the case of a ratification of a contract held that ratification must be in manner and form the same as prescribed for entering into an original contract (12). In a suit to establish the legality of a contract, the provision that a bidder must be acceptable to the PWA engineer was held to constitute the delegation of power in making a contract which the board of education could not delegate (14), and that where a bond of 5 percent was to be provided by a bidder the amount must be equal to 5 percent of the largest amount under any possible combination of base bid and alternates (14). Where a building planned would exceed the sum authorized by voters and where changes in plans would make the cost exceed the authorization, a contractor was not able to recover from a school district for labor and material (2, Sept. 1939), and a university was declared, as an arm of the state, free from suit for breach of contract (8).

### Statutory Lien and Other Protective Bonds

Questions most frequently before the courts in relation to protective bonds dealt with the extent to which deviations from the statutory requirement by bondsmen or claimants affected the claims and whether or not a bond extended to cover a given claim.

In one case substantial compliance was declared to satisfy the law in filing a mechanic's lien (11). In another, while mailing of a properly addressed letter was considered *prima facie* evidence of its delivery, testimony of the addressee that he did not receive it was held to present a question of fact for the trier (12). In other cases involving mechanic's liens and claims for payments under contractor's bonds, it was held that mechanic's liens are statutory and nothing can be considered but the statute which creates them (12); that those who first file claims and those who file within the statutory limit of sixty days shall have priority rights (12); that failure to follow the statutory procedures gives no protection to men who supply material (13); and that a contractor's bond cannot be severed from the statutory requirements (2, Feb. 1941); and that a mechanic's lien against a contractor is a claim against the contractor and not the property (2, March 1939).

Interpretation of the coverage of bonds depended in part on the statutes, but also on the language of the bond contract. Thus a bond to pay for all materials for a building was interpreted as not covering ladders and other items which might be used on more than one job (13); money lent by a material man to a contractor was not covered by a surety bond, nor was workman's compensation or public liability insurance (2, Dec. 1940; 13); a material man was entitled to recover from money owed a general contractor even though the general contractor had paid the subcontractor for whom the material was supplied all that was due him (2, March, 1940; 11; 13); the surety was found liable to a subcontractor under the terms of a bond it had issued to a contractor (2, Sept. 1940); and where a surety bond running to a school district read that the contractor would pay for all materials it was decided that a material man could maintain an action (13).

Other actions before the courts in relation to bonds brought decisions that a subcontractor was free to choose which debts he would pay from payments received (11); that priority to assigners of claims went to him who first filed his assignment (12); that a material man can maintain an action on a surety bond running to a school district provided it reads that the contractor will pay for all materials (13); and a lien was construed as a claim against the contractor and not against school property (2, March 1939).

### Legal Procedures in Securing the School Plant

State regulations and school building codes of the several states were listed in Redford's bibliography of these on school buildings and equip-

ment (25). Under these regulations several cases were tried, with findings that an adequate description of property on the ballot, though technically in error, would not invalidate an election for a school site (24); that a school district may have as many school buildings as are needed (24), that the kind of buildings suitable for school must be left to the governing board (2, May 1941); and that the state has the responsibility to equip all its buildings with safety appliances (28). The responsibilities and restrictions of the board of education concerning the school plant are the subject of comment by Weltzin (30), and Chambers calls attention to the tangle of school law and its effect on the choice of public school (6). What constitutes the school plant and what the equipment, while incidental in a number of cases, were of major importance in a case where it was held that athletic supplies constitute school equipment (26). Hodgdon (16) cites cases of broad definitions of what constitutes the school plant.

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## CHAPTER VI

### Trends in the Construction of School Buildings<sup>1</sup>

WORTH MC CLURE

THE TRIENNium 1938-1941 has seen "spend-lend" domestic policy superseded by "lend-lease" foreign policy, with consequent shift of industrial emphasis and greatly accelerated tempo of general business under the impetus of heavy governmental disbursements. Naturally this transition has not been made without repercussions in the field of school building construction. Previous REVIEWS have commented upon the paucity of systematic research in this field. Examination of the literature of the last three years reveals that this general characterization still applies in spite of the appearance of some excellent studies.

Use of the term "trends" must also be qualified. It is believed important to report not only what appears to be evidence of trends in the sense of preponderance of practice, but also to note, as such, tendencies which although of a minor character may have significance to thoughtful observers as indicating the beginnings of new movements or perhaps the recession of some which have previously been influential. The content of this chapter is therefore subject to both these qualifications.

#### Volume of Building

According to the most recent release of the U. S. Office of Education (14) on the subject, the school plant of continental United States was valued at \$7,115,377,402 or \$274 per enrolled pupil in 1938. This compares with \$6,731,324,741 or \$255 per enrolled pupil in 1936 (13). Average value per urban pupil in 1938 (14) was \$376; per rural pupil, \$167. The number of buildings in 1938 was 229,934, of which 52.8 percent were one-room structures.

In 1938 there were 667 fewer buildings in urban (population of 2,500 or more) communities and 8,806 fewer rural schoolhouses than in 1936 (14). Major factor in this decline was reported to be a reduction of 11,635 in the number of one-room structures, which in 1936 represented 55.6 percent of the total. It was also stated (*ibid.*) that during the ten-year period 1928-1938 the number of one-room buildings declined from 153,306 to 121,178. Smaller buildings in the smaller urban centers, it was stated, were also replaced by larger consolidated units. Evidence of this also was the fact that average enrolment of urban schools in 1938 was 497.7 pupils as against 480.9 in 1936. Average enrolment of rural schools for 1938, 62.1 pupils, remained virtually at the 1936 level.

<sup>1</sup> Bibliography for this chapter begins on page 200.

In spite of the decreased number of buildings, however, there was reported an increase of \$21 per enrolled urban pupil and \$13 per enrolled rural pupil in the 1938 average value of the school plant over that of 1936. Capital outlays for sites, buildings, and equipment in 1938 totaled \$238,853,496 or \$10.71 per pupil in average daily attendance in continental United States. This figure compares with a total of \$171,321,674 or \$7.68 per average daily attendance pupil in 1936, and with a capital outlay of \$17.44 per average daily attendance pupil in 1930. Total enrolment declined 1.5 percent from 1936 to 1938 (14).

### Effects of Federal Grants-in-Aid

Forrest W. Allen, director of information, Federal Works Administration, reported (1) that PWA and WPA together, operating "in nearly all the nation's counties, have constructed or improved nearly 40,000 educational buildings" at a total cost of \$1,457,869,066, exclusive of WPA activities since July 1, 1938. During the fiscal year ending June 30, 1939, the latter agency constructed or improved 8,248 school buildings, representing a total expenditure by WPA and sponsors of \$276,330,056. Since WPA projects active on June 30, 1938, but completed before June 30, 1939, were included in both sets of data, it was noted that cumulative totals were not to be derived by adding the corresponding figures for both periods.

Four purposes, Allen reported, were served by federal grants-in-aid: (a) to provide new facilities for shifting and growing populations; (b) to replace unsafe and obsolete small buildings with modern, consolidated schools; (c) to provide replacements for "obsolete, overcrowded buildings without proper heating, ventilation, lighting or sanitation"; and (d) to provide needed additions to existing buildings.

According to Smith (59), who reported on the basis of official figures, total value of educational construction projects aided by PWA, WPA, NYA, CWA, and ERA for the six-year period 1935-40 was \$1,801,100,000. Of this construction work, 70 percent was estimated to represent construction of elementary- and secondary-school buildings. Smith estimated building financed entirely by states and local districts during the same period at \$300,000,000, making a grand total of \$2,100,000,000 or a yearly average of \$350,000,000, equalling that of the ten-year period 1920-30 and amounting to 85 percent of the all-time high annual average of \$400,000,000 attained during 1925-30.

On the basis of personal investigation, Smith also reported the construction during the 1935-40 period of 5,358 Negro schools, mainly rural, in 883 counties of 15 southern states, with a pupil capacity of 663,000, replacing some 10,000 "dilapidated, unsightly buildings." Credit was given also to the Julius Rosenwald Fund for assistance by provision of matching funds.

### Efficiency of Planning

Allen (1) reported that federal aid programs required fire-resistant and earthquake-resistant construction. Editorial commentators (5) noted that insistence upon modern design had "almost eliminated" the historic styles and that PWA buildings had cost more but were safer, and stressed the need for research in planning along lines of adaptability to new programs and costs of the new services. In an analysis of 198 PWA projects in 163 communities in 52 of the 62 counties of New York State completed between June 1933 and July 1936, Herber (32) concluded that the increased cost due to PWA regulations ranged between 10 and 15 percent; that better quality of construction resulted, particularly in smaller communities; that building layouts were determined locally with advice of the state education department; that, indirectly through time limitations, planning was affected; that besides the buildings themselves, landscaped grounds, larger buildings, and gymnasiums were the most commonly reported facilities beyond what would normally have been possible. Herber's findings regarding the time element in construction with aid of PWA were confirmed by editorial judgment to the effect that the haste involved prevented desirable advance planning (5).

Schmidt (57) noted a trend toward prebuilding surveys. School surveys reported commendable advance planning of new and projected construction in relationship to city planning (60, 61). Quality of new construction also conformed to acceptable standards of safety, sanitation, and general character of construction. Tendency to think of a school building as a standardized unit without provision for special needs of the community was criticized. Both studies provided data for long-range planning of the school plant in terms of population trends and social needs.

*State relationships to planning*—State education departments have been active in advisory assistance to local districts where legislation has made such services available (19, 30, 32, 48, 60, 63).

### Financing Construction

Comprehensive studies of financing during the three-year period are not available. Moehlman (41) and Mort and Reusser (43) agreed that bonding is still the universal practice in financing construction. The former recommends the pay-as-you-build policy while the latter believe bonding more feasible in smaller districts and more likely to assure adequate provision for educational needs. Among disadvantages noted were increased total cost and tendency toward extravagance. Indebtedness of school districts has been limited in most states (43). Moehlman reported that by January 1939 seven states had aided local district projects (41).

Total indebtedness of school districts in continental United States was \$2,835,050,566 in 1938, as compared with \$3,043,125,380 in 1936, representing a decrease of approximately \$10 per pupil (14).

Expenditures for debt service totaled \$283,846,442 in 1938; \$204,682,410 in 1936. These figures compare with a total of \$144,950,229 in 1930. Average interest charges in bonded and current indebtedness were \$5.12 per average daily attendance pupil in 1938, \$5.96 in 1936 (14).

### Construction Costs

Costs of general construction have risen during the 1938-41 period. Shute (58) reporting national trends in average costs for residence, apartment, commercial and industrial building showed that 1941 costs of all these types of construction were higher than in 1938. Shute's figures were based upon costs in sixteen geographically representative cities. Another national index, based upon quantity and price analysis of four types of building—frame, brick, concrete, and steel—and based upon costs in thirty geographically distributed cities, stood at 215 for May 1941 as compared with an average of 199 for the year 1938, the yearly average for 1913 representing 100 (2, 3).

Notable work was done in the field of cost analysis. The St. Louis survey (60) revealed differences in the costs of brick work and cut stone to the advantage of more recent construction. Concrete and steel frame buildings were found to be cheaper than wall-bearing structures. In the Pittsburgh survey (61), cost analyses were related to (a) space allocations in several recently constructed buildings; and (b) costs of general construction, heating and ventilating, electrical work, and plumbing. Among units found advantageous for analysis were the costs per cubic foot of habitable space and per cubic foot of educational space.

Two studies, reported in an earlier chapter in this issue, will greatly facilitate objective comparisons of building plans hereafter and lay the basis for trend studies. These are the studies by N. L. Engelhardt, Jr. (26) and Bormann (16). In a general discussion of cost factors, Holmes (34) stressed the importance of efficient use of space to lower costs, and Kilham (36) recommended rebuilding rather than remodeling as a general practice if cost of the latter operation would exceed 50 percent of the cost of new construction. He strongly advised against the erection of monumental structures, and suggested the advisability in a period of educational transition like the present of substantial but economical one-story construction which could be amortized and scrapped in thirty years. Long (39) noted the absence of authoritative standards of materials and reviewed a list of materials and other factors which run up costs of maintenance.

### Effects of a Developing Education Program

Educational literature has been much concerned with the changing character of the educational program, both horizontally and vertically. There is evidence that this is affecting the character of school building construction in various ways. Available studies point, however, to con-

siderable lag between educational theory and school building planning. Mort and Cornell (42), after studying educational adaptations in thirty-six Pennsylvania communities selected as representative, found that only fifteen could be given a positive score on the item "school plant planning," in that the school building program was the outgrowth of careful study including appraisal of existing plant; studies of utilization, of the nature and growth of populations; and study of the city plan as it affected the school program. Holy (33) observed that scant attention is yet being paid in actual construction to the demands of the community school program and listed the plant requirements of the community school.

### Community School

In a comprehensive study of what might be termed initial trends, Engelhardt and Engelhardt (25) summarized building planning revealed by several detailed studies of a nationwide character including: (a) adult and community use of schools organized under the twelve-year program; (b) high-school buildings used by adult and community groups; (c) adaptations in elementary-school buildings for adult and community use.

Fulcomer (27), in a study of plans of forty-five buildings erected with PWA grants-in-aid in all the forty-eight states except those of the Pacific Northwest, reported, however, indications of increasing attention to the educational needs of youth and adults in new building construction. Some of his findings were: (a) thirty-eight plans had space for physical education but only twenty-six had conveniently located shower rooms and in only a few instances could these be shut off from the main plant for adult or evening use; (b) thirty-five had stages large enough for dramatic and choral activities; (c) thirty-two had libraries, eight of which were accessible to adults during the day and twelve had library work-rooms; and (d) twenty-two had dining rooms with kitchen attached, large enough to serve the community. Other facilities of a broader program found with less frequency were shops, music rooms, art rooms, health units, and public rest rooms.

*Negro schools*—Analysis of a few available plans for Negro high schools by Fulcomer revealed less attention to educational needs of youth and adults, only one out of five having auditoriums or gymnasiums.

*Rural schools*—Booker reported that thousands of rural districts during the last ten years have replaced, remodeled, or improved rural-school buildings, aided by federal and state grants (15).

### Elementary Schools: Trends

In the elementary field, Moehlman editorially summarized construction trends: (a) more planning for the total educational program; (b) development of site as yet inadequate; (c) some evidence of the use of educational specialists in planning; (d) more generalized classrooms; (e) more

functional design—mass, balance; (f) more attention to safety, noise reduction, and improved natural and artificial lighting (46). Engelhardt (24) provided a set of elementary classroom designs representing all the forty-eight states, including several elevations, detailed drawings of special features, architect's notes, and a checklist for designing elementary-school classrooms with full consideration of the physical, social, intellectual, and emotional needs of children. Owen and Stover (50) reviewed factors to be considered in the design of elementary-school classrooms.

Attention to local community needs in planning received attention. Hauser (31) listed the facilities necessary for meeting the needs of underprivileged neighborhoods. The Pittsburgh survey also emphasized the necessity of special provision for underprivileged districts in order that educational opportunities may be equalized (61). Comparing a study made in 1932 of twenty-one sets of plans for elementary schools with a similar analysis of twenty-two plans made in 1939, both having a wide geographical range, Leggett (37, 38) pointed to apparent trends among which are (a) decline in the number of separate auditoriums and increase in auditorium-gymnasium combinations; (b) slightly narrower corridors (10 feet) in 1939; (c) initial trends toward provision of community use facilities, including one community museum—seventeen of the twenty-two plans studied in 1939 provided for kindergartens but no nursery-school facilities; (e) continued specialization of rooms with abrupt transition in facilities from kindergarten to first grade—more classroom floor area in 1939 with eight plans showing workrooms against none in 1932.

Analysis by the writer of eleven sets of plans representative of various sections of the United States exhibited in a national magazine (47) showed as dominant (majority) features: two-story construction; unilateral lighting; unit ventilation and heating; public address systems; electric clock systems; kindergarten-primary-unit grouping of rooms; kindergartens larger than regular classrooms; auditoriums located on periphery of buildings for community use; movable seating; special library rooms; lunchrooms with kitchens attached; special health or nurse's rooms; and teachers' rooms. As secondary features (appearing in three or more plans) there were: one-story construction; intercommunicating telephone or talk-back; sinks or wash basins in individual classrooms; gymnasiums or recreation rooms located on periphery of buildings; workrooms adjoining classrooms or classroom alcoves; one or more classrooms with individual exits or outside classroom terraces; combination auditorium-gymnasium-playrooms; and separate auditoriums. One school was air-conditioned.

In 1940 the National Council for School Building Construction adopted as standard 18 square feet of classroom space per pupil in lieu of the previous recommendation of 16 square feet (45). The Connecticut Code (19) established 25 square feet as the minimum for elementary classrooms. Comparison of the Council's 1940 and 1935 standards (44) also reveal that the 1935 standard of 30-39 running feet of blackboard for elementary-school classrooms has been modified to an amount sufficient for the teacher's



use, and the Connecticut Code (19) "in general" recommended less black-board than tackboard. Standards for 1940 also call for an elementary site area of 5 to 10 acres, the Connecticut Code 3 to 14 acres.

Reporting the use of makeshift facilities by the WPA in feeding 4,000,000 children during the second semester of 1940-41, Batjer (11) noted that a large number of the schools built or improved by WPA since 1935 provide either lunchroom or cafeteria facilities.

### **Secondary Schools: Trends**

Standards adopted in 1940 by the National Council for School Building Construction (45) include 10 to 30 acres for the secondary-school site, with areas for community use where facilities for recreation are needed and for parking automobiles. The Connecticut Code (19) standards included 7 to 20 acres for sites with recreation, parking areas, and appropriate landscaping. Fulcomer (27) noted the trend toward recognition in secondary-school construction of the needs of youth and adults. Nichols (48) suggested certain unit groupings of rooms in order to facilitate integration of the secondary-school instructional program. Summarizing fifty years of scientific laboratory furniture designing, Campbell (17) noted the current demand for self-performance equipment in units for small groups or individuals. Contrasting with the latter is a demand for economical provision for large classes. Use of waterproof plywood and chemical-resistant hardware was also noted. Similarly on the basis of experience and observation, Friswold (28) listed standards for locker and shower facilities and cited the growing trend toward gang showers for girls. Moehlman (40) noted among industrial arts provisions, trends toward specialized vocational and technical high schools in cities, with programs of instruction and equipment based on individual community surveys.

### **Simplicity, Flexibility, and Expansibility**

Difference of opinion was expressed over the elements of size and permanence of construction. One editorial writer (7) noted both a complaint that in the last three decades buildings have become too large and a reaction against "vast and monumental buildings." Small buildings of economical layout and construction were commended as offering the present best opportunity for solving the school building problem. Another editorial (4) noted that in view of changing populations, changing educational programs, and the rapid appearance of new materials of construction, school buildings have become too monumental, too inflexible in plan and arrangement. Design and construction, it was advised, should be so handled that capital investment will be amortized in twenty-five to forty years. Reference was made to the low cost Parkman School in Detroit, expansible from a small present unit to an eventual forty rooms. Holmes (35) noted that thickness of walls is governed by cold climates, building ordinances of cities, and PWA regulations. Moreover, desirable main-

tenance calls for hard woods in interior finish. He advised against temporary, cheap construction to be written off. The Connecticut Code (19) stipulated that new buildings should be inviting, intimate in spirit, and homelike as opposed to institutional or factory-type appearances.

### **Safety, Health, and Comfort**

Increasing emphasis has been given to provision for the safety, health, and comfort of pupils and teachers. This was in part due to regulations governing construction under federal grants-in-aid (63). Booker noted the recent strengthening of rural-school construction against earthquake hazards, the provision of cyclone cellars, facilities for warm lunches, and improvements in heating, ventilation, and sanitation (15). Under 1933 emergency legislation, California made progress in earthquake protection (29) with state review of plans and advisory service. Trends toward one-story construction, elimination of useless ornamentation, and safer roof construction were noted. Reinforced concrete and rigid steel frames were used to resist earthquake.

### **Lighting**

Hydis (29) noted use of bilateral lighting with shade control with movable furniture, some lighting control by photo-electric cell. National Council on School Building Construction 1940 standards recommended unilateral lighting (45); the Connecticut Code (19) permitted bilateral lighting where movable furniture was used. Tinker (62), after critical examination of research studies on light intensities required for hygienic vision, found errors in some studies calling for high intensities, pointed out the crucial relationships existing between intensities and diffusion, and concluded: (a) where diffusion is unsatisfactory, use 5 to 10 foot-candles; (b) where illumination is well distributed use 10 to 15 foot-candles; (c) if there is no glare, higher intensities may be safely used but without gains in efficiency. The 1940 standards of the National Council for School Building Construction adhered to the American Standards Association recommendations for 1932 and did not accept high intensities (45). As compared with the Council's 1935 recommendations for classroom ceilings, the 1940 standards continue to call for ivory white or light cream but with minimum reflecting factor of 70 percent as against the former minimum of 60 percent. The Connecticut Code (19) called for 10 to 15 foot-candles for regular classrooms.

### **Playground Surfacing**

Cate (18), on the basis of a countrywide survey of surfaces best suited for various activities and grade levels, found use of the various types of surfaces to be in the percentages indicated: natural earth, 37 percent; sand, clay 21 percent; turf, 18 percent; bituminous, 13 percent; crushed stone, 4 percent; Portland cement concrete, 4 percent; and miscellaneous,

3 percent. Cost ranges for the various surfacings were also reported. Cunliff (20) noted that turf is most suitable for large playfields but difficult to maintain on small, concentrated areas or in dry climates; that sand or slag clay is in general use in most cities; that some types of crushed stone produce painful injuries; that bituminous materials are becoming increasingly used; that concrete is more and more used for special game courts; and that use of miscellaneous surfacings apparently depends upon what materials may be available locally.

### Teachers' Rooms

Leggett (38), whose study has already been mentioned, reported that more teachers' rooms were provided in the 1939 plans he analyzed than in those for 1932. The writers' analysis of elementary-school plans exhibited in a national magazine (47) revealed a majority of teachers' rooms to be undesignated as regards use by men or women teachers. Teachers' workrooms as well as retiring rooms were called for by the Connecticut Code (19). Ryan in a limited study of teachers' "pet peeves" about buildings (52) reported in order of frequency of mention: (a) lack of storage space; (b) inadequate, unreliable, or noisy ventilation; (c) failure to improve classroom lighting in accordance with current advances; and (d) lack of teachers' rooms. Other objections were listed in lesser frequencies.

### Predictions of Future Trends

As announced at the outset of this chapter, some secondary or initial trends have been noted for the benefit of those who may wish to anticipate the emerging outlines of the future on some basis other than that of the crystal ball. To the same end it may not be entirely amiss to include mention of a few predictions which appear to have basis in significant fact, experience, or observation.

The St. Louis survey submitted recommendations looking toward provision for nursery-school-kindergarten-6-4-4 operation by 1950 (60). Among the general recommendations of the Pittsburgh survey (61) were coordination of school planning with city planning; participation of the educational staff in planning school buildings; continued policy of enlargement of school sites; provision for increased community use of buildings and grounds; special variations of the school plant to meet the needs of underprivileged areas. Fulcomer (27) believed that new ideals of architecture will emerge if less expensive materials, the function of the school plant as the principle motivating its architecture, and the expressed needs of the community become the planning constants.

N. L. Englehardt, Jr., proposed a future elementary school which would include the nursery school, kindergarten, and children of the first six grades. He recommended separate housing for (a) the nursery school; (b) the kindergarten-primary units—a group of rooms with a large

covered work-play space; and (c) the upper elementary unit. Also recommended was provision for community recreation and health activities (23). Following the n-kg-6-4-4 community school concept secondary-school proposals were also made (8) including: (a) provision for an intermediate school of four years; site of 15 to 40 acres with various outdoor educational, recreational, and parking facilities and building designed functionally to serve an integrated program for youth and adults; (b) secondary-school facilities located on a site of 50 to 100 acres, in general similar to that for a small, well-equipped college, including several buildings housing related units; outdoor recreation facilities for adults and students; and development for a community center as well as for an instructional plant.

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## CHAPTER VII

### Furniture and Equipment for School Buildings<sup>1</sup>

T. J. TORMEY

TRUE (70) PUBLISHED AN ARTICLE ENTITLED "Wanted: Equipment Research." The title expressed a need that has existed and does still exist. Setting up standards as proposed by Klehm (37, 38) for industrial arts, or as suggested by Morphet (50), and as is being carried out to an extent (35, 50), is but a part of the research needed. For instance, the use factor hardly has been considered. Certainly, it has not been adequately considered under controlled conditions, taking into consideration such factors as climate, humidity, amount of use, longevity, location with respect to heat and sunlight, and ease of care and repair.

It should be noted that certain items which may be a specified part of a building are in a sense equipment. In this classification come light fixtures, blackboards, public address systems, radios, lockers, showers, toilets, drinking fountains, and door checks. This report does not include many of these items since they are treated elsewhere. In some instances, however, they are included in references cited.

Two excellently prepared and annotated bibliographies have been prepared by Smith and Noffsinger. The first bibliography (66) dealt with college and university buildings, grounds, and equipment. The second bibliography (67) dealt with school buildings, grounds, and equipment. A bibliography on school and college buildings was presented by Leggett (41). In a careful piece of research, Morris (51) listed the various pieces of equipment needed for the auditorium, gymnasium, English, social studies, mathematics, science, domestic science, commerce, shop, language, music, arts and crafts, manual arts, health, audio-visual aids, and student-government activities. Surveys of equipment were made by Larson (40) and Clarson (15).

Zook (76) reported progress in the analysis and development of specifications and standards of school equipment. Working under a grant from the General Education Board and in cooperation with the National Bureau of Standards, tentative specifications have been set up for the folding chair and the removable chair desk and have been issued for study and criticism. In the same report, Zook stated that field work and tabulation of data have been completed in a study of the utilization and distribution of school sanitary facilities and noted the need for a broad research approach to the problem.

<sup>1</sup> Bibliography for this chapter begins on page 207.

### Classroom Equipment

Holmes (32) suggested equipment for the modern elementary classroom. An attempt to determine standards of classroom equipment is well represented by two studies which considered current practice, opinions of educators, and "psychological, physiological, and pedagogical demands." The first, by Browne (12), considered Grades I, II, and III. The second, by Moore (49), considered Grades IV, V, and VI. These studies are subject to distinct limitations of conclusions owing to the sampling. The same criticism may be made of Caulton's survey (14) of physical equipment provided for primary children in a single city. Nevertheless, these studies provide data which are of value. The last named study is particularly interesting in that the tables present not only the general classroom equipment but also accessible equipment, and equipment for reading, arithmetic, science, art, writing, music, social science, and housekeeping.

Cunningham (21) gave consideration to the material facilities needed in the training of intermediate-grade teachers in science, made a curriculum analysis, made a firsthand study of the material facilities of seventeen eastern teachers colleges, and secured data by correspondence with educators in twenty-five elementary schools. He concluded that "judging from the findings of the study, it would seem that the curriculum analysis was most valuable in indicating what best procedures should be, since the actual laboratory experiences provided in teachers colleges and elementary schools were in many cases far from the best practice." MacMorris (45) worked out the needed equipment for teaching elementary sciences, Grades I to VI, inclusive, in New York State.

Beatty (6) advocated individual tables and chairs for the schoolroom and much display board. Long (43) reported a study in progress to determine a cross section opinion as to desirable types of equipment for elementary grades, stating that the returns showed a preference (a) for tables and chairs for groups of four to eight for kindergarten and Grades I and II, (b) a mixture of group tables, chairs, and movable desks for Grades III to VIII. Bennett (7) advocated liberal table service in addition to the individual seating arrangement for the pupil. Atticks (3) argued that natural variations of length of arms and legs as compared with the length of trunk in different individuals and at different stages of development of the same individual prevent solution of the seat adjustment problem by establishment of a direct relationship between the elevation of the pupil and the height of the desk above the seat. Fields (23) made a study of elementary-school blackboards. He recommended boards 30, 34, 36, 38, 40, and 42 inches in height for the respective Grades I to VI. He also made a comparison of the qualities and faults of boards of slate, composition, glass, slate cloth, swinging, and reversible.

### Special Rooms

While the term "special room" probably will stay in the educational vocabulary for a long time, it should be noted that there is an increasing tendency for rooms of the laboratory type to be multiple purpose rooms. Perhaps the same may be said of rooms of the auditorium, the library, and the office type. Bowers (8), in a rather detailed study of the floor plans of twelve school cafeterias, considered the elements of floor planning, equipment placement, and equipment specifications. The equipment for high-school homemaking departments in schools enrolling up to 150 pupils was studied by Grosseohme (29). Brennen (10) dealt with plumbing for home economics.

Fiester (24) and Willy (73) studied the equipment needs of the general shop. Wilson (74) suggested arrangement and design of shop equipment for vocational agriculture. In the appendix is a list of tools recommended. Katenkamp (36) discussed farm equipment for teaching purposes. Trade training in San Francisco was discussed by Mullany (53).

Crutcher (19) surveyed auditoriums and stages in Kentucky. From an equipment viewpoint, his study is worthy of special note since it is an exploration into an area probably not too well known by administrators. Equipment for combination auditoriums-gymnasiums in small high schools was considered as a part of a study by Watson (72). Adee (2) made a study somewhat similar for a combination music-auditorium-gymnasium room. Friswold (25) dealt with showers and gymnasium lockers. Luehring (44) treated swimming pool construction and operation.

Gibson (26) suggested not only what equipment should be in a social studies laboratory but gave directions for constructing such equipment. Using a checklist technic by which teachers in the several fields expressed preferences, Carroll (13) set up certain recommendations for equipping a combination social science, English, and language room. Martin (47) recommended certain equipment for geography rooms.

Holmes (33) suggested kindergarten equipment. Gilbert (27) discussed library equipment. Hamilton (30) to some extent dealt with equipment in connection with an administration building. Crink (18) studied office equipment in four sizes of high schools. Wilson (74) also treated this subject.

Moore (48), in appraising the health program of a large elementary school, gave consideration to the physical equipment. Roos (62), in his dissertation, presented many excellent tables listing equipment for health service. Roos (63) considered equipment for the health room in a small school, and Nelson (55) discussed the effect of school furniture on health. Martens (46) proposed a layout for a single unit for an orthogenic backward class. Landell (39) recommended equipment for a room for retarded children.

### Special Features and Services

While lighting is discussed elsewhere in this issue, individuals interested in research on lighting equipment for the various types of classrooms will find an excellent base reference in the work of Ray (60). He noted that light, lighting, and seeing—all three—must be understood by those who would provide artificial illumination.

Automatic stokers and natural gas in school heating were studied by Myron Anderson. Among other conclusions, he stated that (a) both types of installation create a more uniform cost of heating from year to year than hand-fired coal, and (b) thirty cent gas is about equal to \$5.55-\$5.78 per ton for stoker coal. Napier (54), in a study of twenty-five schools in Oklahoma, attempted "to determine an efficient, satisfactory, and economical procedure in the administration of heating and ventilating equipment in a county and vicinity in Oklahoma."

With the great increase in use of public address equipment, research in that field would seem to offer great possibilities. Guy H. Aynes studied such equipment in Texas schools. In addition to defining terms in this little explored area, he determined the status of public address systems in the state and recommended (a) that in large rooms a special study of acoustical problems should be made before any equipment is purchased, (b) that loud speakers be provided for every classroom in the system, (c) that microphones should be located in places adaptable for work, (d) that recording equipment be purchased, and (e) that before considering the purchase of public address equipment, one should determine definitely that the money could not be used more advantageously for some other device or function of the school. Sigman and Garner (65) appraised two types of motion picture equipment. Bocker (11) recommended desirable equipment for the school radio and public address system.

Recessed lockers have become well accepted. Photo-electric cells for light control are noted. Folding bleachers are looked upon with favor. Articles dealing with equipment for special rooms, primarily, included those of Adams (1), Bates and Pieper (5), Breitenbach (9), Dotzour (22), Gillis (28), Little (42), Persell (59), Reinertsen (61), Smull (68), and Witte and Helble (75). Special equipment, including such an item as an elevator for coal, is reported by Jensen (34) and Stevens (69).

### Playgrounds

We are hearing much of physical fitness, or lack of it, on the part of draftees. Increasingly, there is a shift of responsibility to the school for exercise and recreation of youth and adults. Therefore, it would seem that information as to equipment for specific purposes and for various stages of development is needed to a constantly increasing degree. Warden (71) suggested the amount of equipment needed for games and recreational activities. Austin (4) surveyed playground areas and equipment of certain

rural schools and recommended equipment for schools having enrolments of less than, and more than, 400 pupils. A study confined to a limited area, but which is suggestive of needed studies, is that of Seger (64), who delved into the matter of an adequate building and recreation field suitable to the needs of a revised program in health and physical education for a New York normal school. O'Keefe (57) advocated making games such as can be played at home and recommended certain apparatus. Peavy (58), on the other hand, was concerned with the misuse and repair of equipment. Crawford (16, 17), Cunliff (20), and Hardy (31) have all dealt with the subject of playground surfacing.

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## CHAPTER VIII

### School Lighting<sup>1</sup>

WILLIAM O. ENGLE

SCHOOL LIGHTING is not a new problem to educators. Although, as reported by Noffsinger (30), glass windows in school buildings were rare as late as 1820, natural light was utilized to some degree, and by 1847 the first use of unilateral lighting appeared in Boston. By 1868 the value of high windows was recognized, and in 1874 the New Jersey Department of Education recommended windows with square heads. The window-floor ratio seems to have been first determined in 1877 when a window area equal to 10 percent of the floor area was recommended, but prior to that time Kiddle and Shoem had called for 200 square inches of window area for each child. Between 1879 and 1889, the glass-floor ratio varied from 15 percent to 50 percent and, during this same period, factors for determining the width of a room were appearing.

It was generally agreed that no desk should be a greater distance from the nearest window than  $1\frac{1}{2}$  times the distance from the floor to the top of the window, and curiously enough, this rule is still in use in many states today. That the intensity of light required for doing visual work might be determined was first suggested in 1888. Since 1900, more and more attention has been given to light intensities, and with the advent of accurate light measuring devices, more positive steps have been taken.

#### Natural Lighting; Windows

As reported by Seymour (34), natural lighting “. . . tends to receive less attention partly because no one can make a commercial profit out of it.” Taylor (37) has observed that natural light in the classroom may depend on weather conditions, architectural design, fenestration, or on window shades. Hamon (15) and Eckles (10) recommended that classroom windows face either to the east or west, but Gradle (12) called for a northeast or northwest exposure. Naturally, the desirable exposure will vary slightly in different geographical locations, but no scientific and experimental data in support of any such recommendations have come to hand.

Ives (21) stated that in 1928 two-thirds of the schools which reported specified unilateral lighting as being the most desirable. This specification has had the support of many interested parties, and it was not until 1937 when Harrison and Fouilhoux (18) presented their arguments that bilateral lighting was given much attention. These architects analyzed the

<sup>1</sup> Bibliography for this chapter begins on page 219.

problems by presenting a set of arguments in favor of both types of window location. Seymour (34) called attention to the fact that increased intensities can be obtained by borrowing light from the corridor side of the classroom, but this assumes that the corridor has some source of natural light. Harrison and Foulhoux (17) diagrammatically proved that many of the doubts concerning bilateral windows can be dispelled by the less rigid seating arrangements made possible by the movable desk.

Since 1877, when a window-floor ratio was first determined, there has been a wide range of figures covering this rule. These figures have varied from 10 to 50 percent, but by 1930 some stabilization had been reached when Hopkinson (20) reported that two states followed a ratio of  $16\frac{2}{3}$  percent, thirteen states used 20 percent, and two states 25 percent. Recent recommendations continue to show a similar variation, with Harrison and Foulhoux (16) advocating not less than  $16\frac{2}{3}$  to 20 percent, a Committee on Standards for Lighting Sight Saving Classrooms in Ohio (32) 20 percent, and a top figure of 25 percent recommended by two writers, Gradle (12) and Hamon (15). That such a ratio may not be satisfactory is pointed out by Harrison and Foulhoux (17) in stating that "... with a window ratio of 20 percent, the intensity on the far side of a room is frequently less than 5 foot-candles on a bright day."

That no window should extend below the top of the pupil desk level has been a generally accepted rule, but Harrison and Foulhoux (17) suggested that "... a second floor classroom does not require a sill as high as that required in a first floor classroom to render a single source of glare invisible." Such a deviation will permit an increase in natural illumination, permit the pupils to enjoy an outside view, and allow a greater flexibility in architectural design. It is further recommended by them that the soffit of the window head be raised to within 1 or 2 inches of the ceiling if construction permits, that the formerly blank wall beyond the front row of desks be utilized for natural lighting, and that mullions be less than 12 inches wide and evenly spaced.

Six types of windows are the double-hung, the casement, the projected, the horizontal pivoted window, the sliding or sinking window, and the fixed window are mentioned by Harrison and Foulhoux (16). In choosing a window type they listed twelve considerations.

Except for those undesirable areas where pupils may be required to face the windows, a drawn type of clear glass with a high factor of light transmission should be used. Jackson (22) and Harrison and Foulhoux (16) have pointed out the possibilities of using a prism glass near the top of the window for the purpose of directing the light rays to the far side of the room, but for the present, at least, this type of glass is too expensive for general use. Regardless of the type of window used, or the quality of glass in these windows, it is highly essential that the glass be kept as clean as possible. Seymour (34) found that dirty windows may reduce the light at the window by as much as 65 foot-candles, and at a

distance of 12 feet from the window the light may be reduced by as much as 15 foot-candles.

Hamon (15) stated that the "... misuse of window shades has resulted in the permanent injury to the eyes of thousands of American school children." Most authorities agree that the shades should be translucent and operate from the center of the window so that it will not always be necessary to cut off the light from that all important top portion of the window area. The Venetian blind is attractive and somewhat effective but is usually supported at the window head which does not permit the flexibility of the dual shades supported at the middle, and it cuts off top light when pulled up. Regardless of the type used, the color should be light so that the reflective factor will be high.

Skylighting has received little attention from school architects and lighting experts in recent years, but Hamon (15) stated that when used it should be of the saw-tooth type and face north so that the direct rays of the sun will not shine directly on the working plane of the pupil. Most writers agree that many of the lighting difficulties, natural and artificial, can be materially lessened by the use of the movable seat and desk. A survey by the teachers of the John H. Francis Polytechnic High School in Los Angeles, California (28), revealed to those with poor vision the advantages that a shuffle in the seating arrangement can bring about.

### Intensity of Illumination

The central issue in the question of light in the classroom seems to be, How much light? As Noffsinger (30) has said, "It has only been since 1900 that the problem of scientifically determining the light intensity required has been considered, and even by 1928 only a few schools had recommended standards for artificial lighting." It is natural that much of this work should have been pioneered by the Illuminating Engineering Society, but it is regrettable that more work of an original nature has not been turned out by individuals and organizations with nothing to sell. Consumers' Union (3) reported that half of the sustaining members of the I.E.S. are power companies, and it is only natural that school administrators, interested in keeping their costs as low as possible, should view with alarm the greatly increased recommendations of the American Standards Association which have been made during the last ten years. The recommended intensities have, in many instances, been tripled, and present indications seem to point toward even higher intensities of illumination.

Halsey (14) estimated that the revision from the 1932 minimum standards to the proposed standards of the I.E.S. for 1938 would cost the nation \$22,500,000 for additional current alone. The Electrical Division of the New York City Board of Education's Bureau of Con-

struction and Maintenance (27) estimated that the recommended increase in lighting would cost the nation around \$15,000,000. We have not, as Halsey (13) has said, been able to "determine what are the lowest intensities of properly distributed and diffused artificial light that can be used in various parts of a schoolhouse to provide conditions for correct visual acuity and prevent deleterious effects on the eyes of the users of the schoolhouse."

### Needs Expressed in Watts

A number of lighting engineers have calculated the lighting needs of the classroom in terms of watts per square foot of floor space. Lebenshon (25) stated that in a light colored room from 1 to 3 watts of indirect light per square foot will give from 10 to 30 foot-candles of illumination. Hamon (15) suggested 2 watts per square foot, while the American Standards Association (29) and the National Electrical Manufacturing Association (36) recommended 4 watts per square foot for classrooms but varied the wattage considerably for other parts of the building. A summary of their recommendations follows:

#### MINIMUM WATTS PER SQUARE FOOT OF FLOOR AREA

	<i>American Standards Association</i>	<i>National Electrical Manufacturing Association</i>
Classrooms .....	4	4
Libraries .....	4	6
Offices .....	4	5
Sewing, drafting, detail rooms.....	7	7
Shops, laboratories .....	4	3
Gymnasiums .....	4	3
Auditoriums .....	2	2.5
Locker rooms .....	1	not given
Cafeterias .....	2	2.5
Corridors, stairs .....	1	not given
Toilets .....	1	1
Sight-saving rooms .....	8	7

Seymour (34) noted that lamps should be operated at the correct voltage; a drop of 5 percent in voltage will result in a decrease of approximately 17 percent in lamp output. The voltage of all schools should be carefully checked under full load so that all lamps may receive the correct voltage. Councell (5) pointed out that as new installations calling for an increase in wattage are considered it is necessary to check carefully the existing wiring, panel boxes, transformers, and transformer boxes. He recommended a number 12 or even the heavier number 10 wire in place of the light number 14 so frequently found in the earlier installations.



### Experimental Studies of Light Intensity

Layton (24), in a study of two fourth grades with balanced IQ's, found that the experimental group, working under indirect light with a minimum intensity of 12 foot-candles and a maximum of 15 foot-candles, made greater academic progress in reading than did the control group. In reading, the control grade showed a gain of 2.1 percent as against 16.3 percent for the experimental group; in reading comprehension the control group gained 8.5 percent while the experimental grade improved by 21.0 percent. In arithmetic the reverse was true. The control grade gained 8 percent against 4 percent for the experimental grade. Tinker (38) found that after a 2-minute period of adaptation the average person was able to read no faster under 17 foot-candles than under 10, nor were the individuals tested able to show any appreciable gain under 53 foot-candles. When given a 15-minute period of adaptation, his statistics show that the reading rate will be the same for intensities of 3 foot-candles and 10 foot-candles. As a result of this study he concluded that "when the eye is adequately adapted to the light intensity under which it is to work, the critical level for effective seeing is at about 3 foot-candles or slightly below." In another study by Tinker (40), he refuted the earlier studies by Albert (1), Allphin (2), Dates (9), and Johnston (23), in which they cited academic gains to be had from greater light intensities. He found that the difference in brightness had no effect on school achievement, and that the American Recommended Practice of School Lighting is based largely upon conclusions derived from misinterpreted results. Tinker (39) further stated that ". . . instead of preferring 100 foot-candles as suggested by Luckiesh and Moss, 5 to 10 foot-candles are chosen when the eye is adapted to the illumination ordinarily found in homes and offices. None of this evidence indicates that ease and comfort in reading is increased by exceedingly high intensities of light."

Lebenshon (25) stated that a high illumination produces stimulation and attention whereas subdued lighting produces restfulness and inactivity. He recommended a minimum of 10 foot-candles for reading. Viles (41) pointed out the necessity of considering the long-time effect of high pressure activity (which is supposedly possible under great illumination) on the nervous system of the child. Flagler (11) objected to indirect light because of its cold quality and lack of "eye appeal" and for this reason preferred the semi-indirect luminaire.

### Recommendations for Further Study

Halsey (14) said that we need experimentation by ophthalmologists, educators, and engineers rather than statements by I.E.S. men working for the power industry. Loos (26) suggested that ". . . the whole problem of school illumination would be a proper undertaking for some

foundation concerned with education. The unbiased findings should create an economical and hygienic basis for determining how much illumination is needed for the physical and educational good of children." Tinker (40) called for some unequivocal experimental evidence and believes that such statements as "higher values will contribute to greater accuracy, speed, and ease" should be dropped until they can be supported. Consumers' Union (3) wrote that ". . . at a time when advertising associations and super-patriotic commercial groups are spending a great amount of energy beating the drums for an investigation of school textbooks which criticize advertising, it would seem proper to suggest that someone look into utility propaganda in schools for larger electric bills." Viles (41) expressed the opinion that the "acceptance or rejection of the proposed standards or adoption of substitute standards can best be qualified by additional controlled studies where benefits and costs are carefully evaluated."

### Glare

Glare has been defined by Dr. M. Luckiesh of the Nela Park Laboratories of the General Electric Company as "that factor in the lighting situation by which a bodily disturbance arises, characterized by expressions of discomfort, distraction, irritation or pain, which are referred to absolutely or relatively high brightness in the visual field." L. S. Ickis of the General Electric Company divides the condition into two parts: "direct glare, which is measured in candlepower at the eye emanating from light sources, and reflected glare, which is largely a matter of brightness contrast superimposed on the seeing task." Eckles (10) has defined glare as "any brightness within the field of vision of such a character as to cause discomfort, annoyance, interference with vision, or eye fatigue." Glossy finishes cause reflected light glare whereas direct glare is such as looking at a window opening toward a bright sky. A number of ways of measuring glare have been suggested. The Lancaster pencil-shadow test calls for a pencil held parallel to a piece of paper about 3 inches above the surface of the plane on which the paper is resting. The paper should be so placed that the light will fall perpendicularly upon it. If the light is well diffused the shadow of the pencil is very blurred, but if the shadow is clear-cut the light is not well diffused but concentrated and not agreeable for reading. Flagler (11) says that the amount of glare can be measured by the sharpness of outline of the illuminating unit on the mirror effect of a polished table top.

Glare indoors is, as a rule, not the result of too much light but rather a result of poor distribution. The light should be so widely diffused that almost no shadows are cast by it. Oday and Sturrock (31) have said that ". . . we accept the principles of higher illumination, but question the advisability of attempting to reach these levels without properly designed fixtures to prevent bright spots and glare."

Most schools are, at the present time, using an incandescent source of artificial illumination with one of the three types of luminaire: semidirect, semi-indirect, or indirect. The semidirect luminaire, usually a frosted glass globe, permits a large percentage of light from the source to shine directly on the working plane with only a small portion of the light being reflected from the ceiling. The semi-indirect luminaire, usually an opaque plastic or glass, throws the greater percentage of the light on the ceiling from where it is reflected to the working plane. The indirect luminaire reflects the light from the source onto the ceiling permitting no direct rays on the working plane. The semi-indirect and indirect luminaire offer the distinct advantage of considerably reduced glare but require an appreciable increase of source intensity to give an equal foot-candle rating on the working plane. Studies by Palmer (33) and Halsey (13) emphasized this fact.

Realizing that glare from the semidirect luminaire can be minimized by using globes that are sufficiently large, Palmer (33) worked out the following table:

<i>Size of Lamp</i>	<i>Globe Diameter</i>	
	<i>Minimum</i>	<i>Maximum</i>
150 Watts	12 in.	14 in.
200 Watts	14 in.	16 in.
300 Watts	16 in.	18 in.
500 Watts	18 in.	20 in.

A series of experiments by Seymour (34) suggested that the glass globe that is almost spherical in shape gives the greatest output of light.

### Fluorescent Lighting

One possible means of improving lighting intensities without increasing wattage is the recently perfected, and commercially popular, fluorescent source of light. This lamp consists of a glass tube with a filament type electrode at each end. A mercury vapor in the tube produces ultraviolet rays when the electrons flow between the electrodes, and it is the action of these ultraviolet rays on certain phosphors contained in a coating on the interior of the tube that produces the light. Consumers' Union (3) reported that a 60-watt incandescent bulb is required to give an illumination equivalent to that provided by a 15-watt fluorescent tube. The initial cost of the fluorescent tube is greater but its life is estimated to be almost double that of the incandescent bulb, since the diffusion area is about ten times that of a similar output in an ordinary electric bulb, the result is a relatively shadowless illumination. A stroboscopic effect is noticeable when a single tube is used, but it can be practically eliminated by the flicker-corrected two lamp fixture. To eliminate the possibility of glare, Loos (26) suggested the use of glass plates, shields, or louvers on the luminaire. Darley and Ickis (8) listed four items to consider before switching from the incandescent source to the fluorescent source.

### Color and Absorption

Lighting is dependent upon the cleanliness of luminaires, walls, and windows. Street (35) recommended an off-white paint for ceilings with a matt finish surface and a flat, pastel green paint for the walls. Councell (5) suggested flat, white ceilings and walls of a pastel grey, green, tan, or blue, with dadoes in darker harmonious shades of semigloss paint. Hathaway (19) mentioned a warm, buff paint in a room with a northern exposure, soft greys or blue-greens for the sunny room, but warned against the use of yellow, which is a source of fatigue. In any event it is highly essential that a paint be chosen that has a high reflective factor and a lack of glare. Most paint companies will gladly quote the absorption factor and percentage of reflection to be expected from their various colors and types of paint.

Flagler (11) noted that the illumination from lights near the blackboard is always less than in other parts of the room because black will absorb light so heavily. A study by Darley (6) revealed that when an average intensity of 20 foot-candles is provided on the horizontal plane it may be necessary to supplement the illumination for the blackboard as the illumination received on the vertical plane is only one-half to one-fourth as much as is received on the horizontal plane. He recommended a recessed, parabolic-cylindrical type of fixture for this purpose as it throws the light directly on the board surface. Harrison and Fouilhoux (17) pointed out that the blackboard will cause a decrease in intensity of illumination where it is most needed. Although an intensity of 5 foot-candles might be present at the wall, the blackboard might absorb as much as 90 percent of it, leaving only  $\frac{1}{2}$  foot-candle. It has been recommended that blackboards be provided with a light colored shade that can be drawn when the boards are not in use, thus providing a surface of greater light reflective power.

### Location of Light Sources

That the location and spacing of the luminaire is more than just a matter of architectural chance and convenience is a fact that has been recognized for some time. Darley (7) suggested that "... in no event should the spacing exceed the distance from the floor to the ceiling or the space between units and side walls exceed one-half of the distance between the floor and ceiling." Sturrock (36) recommended a spacing "... not greater than  $1\frac{1}{2}$  times the distance from the bottom of the lighting unit to the top of the desk top." When the indirect luminaire is used, he found that the maximum spacing may be increased about 2 feet over the above rule.

### Control of Classroom Lights

It is generally agreed that the two rows of lights in classrooms should be independently controlled so that the inner row may be put into use

during those periods when it may not be necessary to operate the row nearest the windows. The mechanically operated control which utilizes the photo-relay system is receiving considerable attention at the present time. An "electric eye" automatically turns on the lights when the intensity of natural light falls below a predetermined foot-candle rating and automatically turns the lights off when the natural light becomes more intense than the artificial light in the room. A manual control is maintained so that the system may be disengaged during those periods when the room is not in use. Cornet (4) described a building where several similarly located rooms are adequately controlled by the same photo-relay system. Hamon (15) has found that most of the experimental installations of automatic control are too sensitive, and that they switch the lights off and on too often. Eckles (10) is of the opinion that the relay control system would be more satisfactory if it were so designed that it would maintain a minimum light supply by gradual increase in intensity with decreases in natural light. Once the technical difficulties have been removed, the photo-relay system should offer an excellent way of unifying classroom illumination and at the same time substantially reduce waste resulting from the needless use of electrical energy.

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## CHAPTER IX

### Bonds To Finance School Buildings<sup>1</sup>

FRANK P. BOGLE

A LARGE PORTION OF THE LITERATURE pertaining to school bonding is to be found in connection with municipal bonding. There has been a considerable number of accounts written which are descriptive of successful bonding campaigns or suggestive of trends and best practices. These, however, would hardly be classed as research. One of the first primers on bonding which has been considered basic in the field was Fraser Brown's *Municipal Bonds* (1). Even though it dealt with municipal bonds, most of the content was equally adaptable to school bonds. The study considered the bond as a negotiable instrument, types of maturity, the sale and award, validation, and the functions of the attorney. Fowlkes (7) in 1924 made a study of the entire area of school bonds. He covered all the phases of the bonding program—justification, marketing, retirement, and bond accounting—and included the public relations aspect as well by suggesting many campaign devices and materials. Different kinds of bonds were described and their relative advantages and disadvantages pointed out. Clark and Royalty (4) studied the effect of broad seasonal swings in the bond market on the timing of offerings and the accuracy with which trends could be predicted. Halsey (9) also studied seasonal fluctuations in the bond market and criticized the bases of the Clark-Royalty predictions.

Garvey (8) studied the legal requirements in the various states on school bonding. The state laws dealing with the purposes, authorization, debt limitations, sale, refunding, and redemption were presented in tabular form. Smith (14) surveyed the debt limitations in all the forty-eight states—the amount of the limitation, its base, and its source, whether statutory or constitutional—and drew comparisons by reducing them to a common denominator. The study contained the pertinent extracts from the school codes of all the states. Complete tables set forth various state bonding regulations with reference to the kinds of bonds, maximum duration, vote required, type of sale, minimum sale price, and maximum interest rates.

In 1927 Chamberlain and Edwards (2) published a revised edition of their scholarly and frequently quoted text dealing with all types of bonds. This was written from the investment standpoint. The first part contained a basic treatise of bonds as investments and also a classification of bonds as to the obligor, the security, the purpose, and the conditions attending payment. Part Two discussed civil loans—their nature, history, security, and validity. During the same year Engelhardt and Engelhardt's *Public School Business Administration* (5) made its appearance and continues to be the school administrator's most common reference. Its section on school bonds considered the kinds, life, authorization, and sale. A complete bond trans-

<sup>1</sup> Bibliography for this chapter begins on page 223.

cript was included as well as suggested accounting forms. The Investment Bankers Association of America (10) issued a statement embracing their suggestions for sound and economical procedure in the issuance of bonds. Their recommendations were embodied under four sections: safeguards through constitutional or legislative enactments, purposes and form of bonds, sale of bonds, and financial condition and operation of the municipality.

The merits of bonding as a means of financing capital outlays were weighed against pay-as-you-go by Essex (6). Such factors as spreading the costs of school buildings over a period of years in order to reduce the present subjective burden on taxpayers and to permit those people who derive the benefits to share the costs were measured against the dangers of imposing upon the future an ever increasing debt load. Kirshman (11) in evaluating different methods of financing long-term improvements pointed out the disadvantages of serial bonds as well as their advantages. The inflexibility of serial bond payments has, through the exigencies of the depression, resulted in many of the bond defaults. In addition, redemption of sinking fund bonds in the open market could often be effected at a considerable saving. Some of the economies which may be effected through intelligent debt management were described by Linn (12). The advisability of resorting to bonding was considered along with the pay-as-you-go plan. Types of bonds were described as were the factors affecting bond rates. The relationship which should exist between interest rates and the duration of issues was discussed and recommendations were made for the coordination of short-and-long-term loans in the financing of school buildings by bonding.

During the 1930's unprecedentedly low interest rates and financial difficulties put a somewhat different light on the practice of refunding and the advisability of issuing only callable bonds. Practices in bidding have undergone some changes and serial bonds have come to be required by law to an ever increasing extent. Doubtless the most significant work which has appeared in recent years embracing these factors was under the authorship of Chatters and Hillhouse (3). The steps in the issuance of bonds were considered chronologically in great detail. Methods of computing the margin of debt-incurring capacity, conducting the sale, computing the best bid, and the preparation of the bonds were given elaborate treatment. Forms for use in bond accounting were exemplified and explained. Sinking fund administration, voluntary refunding operations, and the formulation of a debt policy were studied from the standpoint of sound debt administration.

Rightor (13) surveyed the debt situation—national, state, county, and school—up to 1940. Trends, comparisons, and regional distributions were described and tabulated. The relative effect of the proposed termination of reciprocal tax exemption of governmental securities on state and local incomes as compared to federal incomes was illustrated. He showed in what governmental subdivisions the greatest reductions as well as increases in bonded debt occurred.

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## CHAPTER X

### Cost of School Buildings<sup>1</sup>

N. L. ENGELHARDT, JR.

SINCE 1938 ONLY A FEW MAJOR STUDIES of school building costs have been made. Two of the most comprehensive studies are related to analyses of the costs of fifty-two school buildings built in New York State between 1930 and 1937. In this group were eight elementary, six secondary, and thirty combined elementary and secondary schools. The plans, specifications, and cost data were analyzed in great detail and the results published in two volumes. The major findings of the first of the studies, that by Engelhardt (4), are as follows:

Variations in the plan types of the buildings, as measured by relationships of perimeter, ground area, and cubic contents, were significantly related to variations in general construction costs per cubic foot. The cost per cubic foot of a small one-story structure, with open type plan, was estimated to exceed the cost per cubic foot of a large two-story square building by 10 cents per cubic foot. Buildings with auditoriums above gymnasiums cost 1.2 cents more per cubic foot than buildings with these units located on the ground floor level. The changes in ratio of perimeter to cubic contents were more influential than changes in the ratio of ground area to cubic contents in determining the variations in general construction costs per cubic foot.

The average flat roof, steel-frame building with face brick and tile exterior walls and tile interior partitions costs 2.3 cents per cubic foot less than flat roof, wall-bearing structures with face and common brick exterior walls and brick or tile interior walls. Buildings with flat concrete or gypsum slab roofs on steel frame averaged 2.5 cents per cubic foot more in general construction costs than buildings with gable or hip roofs on wood frames with slate covering.

Average differences in general construction costs per cubic foot as large as 4.2 cents were found between buildings with different types of interior finishes.

A formula for the prediction of general construction costs of similar buildings was developed in terms of the habitable space, auditoriums and gymnasiums, and non-habitable space. This formula had a multiple correlation coefficient of .98.

Variation in the percentages of total space devoted to educational functions was found to be large. It was found that on the average only 41.5 per cent of the total building cubic contents was devoted to instructional and general educational units. The indications were that certain architects designed buildings with higher percentages of educational space than others.

Plumbing and electrical service costs per cubic foot had standard deviations of 0.5 cents, indicating that these items had small influence on variations in the total costs per cubic foot of the buildings included in the study. The total costs of these services were largely influenced by the costs of fixtures.

Fees for architectural services varied from 4.5 to 8.5 per cent of the total cost of general construction, heating and ventilating, plumbing, and electrical work. An analysis reemphasized the well known fact that certain architects charged smaller fees than others and that the schedule of charges established by the American Institute of Architects was not adhered to in all cases.

<sup>1</sup> Bibliography for this chapter begins on page 226.

In the second of the studies, Bormann (3) showed the folly of continuing to make comparisons of school building costs solely on the basis of cost per cubic foot and the advantages of using several other units of cost as bases for comparative cost studies. Cost per cubic foot of educational cubature, cost per square foot of educational floor area, and cost per weighted pupil station were found to be the best units to use for comparing school building costs in terms of their educational serviceability. A building which appears inexpensive because it has a low cost per cubic foot may really be expensive, because only a relatively small percentage of its cubature is available for use. The method of weighting pupil stations which was developed makes it possible to express different types of pupil station, such as those found in gymnasiums, auditoriums, libraries, laboratories, and shops, in terms of an ordinary classroom pupil station. The weighting is based on ratios of cubature and cost. It should be noted that the group of buildings studied is not a random sample of all school buildings in the United States. Many of the buildings in other states are built under varying physical conditions and are designed to fulfil different educational needs and programs. The New York State buildings used in this study are, however, reasonably representative of current school building construction. They conform to accepted standards of safety and sanitation. They are attractive in appearance and sound in construction. It is, therefore, reasonable to assume that units of cost and measures of building size or capacity found suitable for these buildings may be helpful in studying the costs of other groups of school buildings erected in recent years.

In Bormann's opinion (3), comparisons of school building costs should, as a rule, be made in statewide studies. In such studies, unit costs are little affected by differences in legal requirements governing building construction or the educational program. Even climate is fairly uniform in its demands on building construction within each state.

Herber (5), in a study of influence of the Public Works Administration on school building construction in New York State, analyzed costs of school buildings built between 1933 and 1936. A comparative study of nine representative communities indicated a median increased cost of 9 percent due to PWA requirements. General construction contractors reported a median increased cost of 7.8 percent; heating and ventilating contractors reported an increase of .75 percent; electrical contractors reported an increased cost of 3 percent; plumbing contractors an increase of 4 percent; and architects an increase of 5.6 percent because of PWA regulations. The increases in costs were attributed by contractors to PWA requirements regarding local labor, federal reports, thirty-hour week, wage rates, and double shifts for workmen. They reported that delays in approval of changes and extras, decisions of the resident engineer, and delays in payments of federal monies also contributed to the increases in costs.

Holmes (6) discussed the possibilities of economy in school building construction. Wheeler (7) gave some suggestions for reducing structural

costs. He discussed the commonly used systems of floors, frames, and economies which might be made. To encourage such economies, he recommended that:

Those who have the hiring of architects and engineers to plan and supervise the construction of school buildings can encourage their efforts to reduce building costs if they will see that their compensation is adequate and that their fees are based on the amount of the appropriation rather than the actual cost of the building. If this is done, architects and engineers will not be penalized when they save money for their clients.

The *Architectural Record* (1) reported the construction of an elementary school at Fairfield, Connecticut.

In determining type of construction the architects found State school authorities more concerned with circulation and exit facilities for one-story schools than with "fireproof" construction. Hence, plywood was selected. Upon being assured that plywood could be conveniently overcoated, local authorities accepted the architects' recommendations—on trial. Reports now indicate great local satisfaction. In this school was used a patented plywood joint, invented by Oscar Fisher, which makes erection of plywood interior finish fool-proof. Cost 20.5 cents cu. ft.

In design, both architectural and educational, the school is well advanced. The basic unit . . . is a flexible classroom in which are included study alcoves, small libraries, storage closets, work counters with sinks and flexible seating arrangements which permit the children to organize under their own leadership while the teacher supervises the class without bossing it. Interiors of all classrooms are plywood, floors are asphalt tile applied directly to a concrete slab. Thorough ventilation is assured by the use of projected casements and an exhaust system which takes used air through the coat lockers and out to the roof.

The U. S. Office of Education (2) recently made a study of the possibility of demountable construction of school buildings, utilizing prefabricated building materials.

Further research into costs is essential if school buildings are to be maintained at a desirable level of efficiency. Many older sections of our cities have need for new buildings. Under present economic conditions these cities find it extremely difficult to replace their older structures. Similarly, communities with low-cost housing frequently find it impossible to finance the construction of typical forty to fifty cent per cubic foot school buildings. The relationship between initial cost and maintenance has not as yet been adequately treated. The possibility of building nonfire-resistive one-story buildings has not been given sufficient consideration as an alternative to the two or three-story highly fire-resistive construction.

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## **PART III**

### **CHAPTER XI**

#### **Maintenance and Operation of School Buildings<sup>1</sup>**

LELAND W. MOON

##### **Personnel**

VILES (91) DISCUSSED THE SCHOOL JANITOR and his job. He made suggestions for improving janitorial service, listing certain miscellaneous duties of the janitor. Buros (8) listed four types of maintenance jobs that have been performed by the custodian. They are (a) preservation of floors, (b) rehabilitation of buildings, (c) decoration of walls, and (d) making stage scenery. Jongens (40) also listed jobs to be performed by the maintenance employees. The St. Louis Survey (84) made recommendations for setting up a personnel division to obtain better inspectorial service and better coordination of building service workers. Young (96) discussed salaries of custodians as compared to salaries in industry and mentioned the effect of rising labor costs on obtaining better workers for custodians. The Pittsburgh Survey (83) advocated the maintaining of a permanently employed minimum crew of maintenance workers at a reasonable monthly wage.

##### **Work Programs**

Brown (6) advocated a combination of staff and contract method of making school building repairs. Viles and Carpenter (92) mentioned the use of a school janitor for certain maintenance jobs. Allen (3) stated that the members of the maintenance staff in most school systems, although good handy men, could not be expected to do types of repair work that involve technical skills and that it would be wise to segregate such items and let them out by contract. Stouffer (82) reported the use of a small special crew of carpenters, painters, glaziers, and plumbers for maintenance work. Clemons and Johns (10) emphasized the importance of continuous maintenance work. Park (63) believed the school should serve as an inspiration to the community to care for all public property.

Engelhardt (18) and Watson (94) reported the use of a maintenance clinic. Engelhardt (18) gave 115 suggestions to be considered before specifying the construction of new school buildings. He listed them under the following four headings: (a) general, (b) plumbing, (c) heating and ventilating, and (d) electric wiring. McDermith (54) developed a checklist for determining maintenance needs. The subcommittee on electric and elevator systems of Building Manager's Association of Chicago (85) suggested an elevator maintenance schedule of daily, weekly, semimonthly, monthly, quarterly, semiannual, and annual inspections. Hemenway (32) asserted that modern school maintenance is not a handy man's job; the

<sup>1</sup> Bibliography for this chapter begins on page 233.

custodian should do only emergency repairs. He stated that it is necessary for the administration to set up rules clearly differentiating the functions of operation and maintenance employees. Morphet (58), in a survey of the schools of Dade County, Florida, expressed a need for more planning of custodial work. Viles (91) presented a plan for developing a work program and organization of janitorial service.

### **Economy in Maintenance**

Long (50) advocated the use of better materials for lowering maintenance costs, but expressed regret that authoritative standards for materials do not exist; however, he indicated a preference for certain materials as tile over plaster, terrazzo over concrete, and copper over steel pipe. Hill (34) listed six types of material which he considered attractive and which contribute toward reducing maintenance costs to a minimum. Morphet (58), in a survey of the schools of Dade County, Florida, reported a need for more emphasis on maintenance, particularly on the study of maintenance costs in relation to construction weaknesses and difficulties. Holmes (37) stated that the demands for good maintenance dictate the use of hard woods for interior trim, of a good grade of hardware, plumbing fixtures, floor finishes, plaster, and painting. Newman (61) gave suggestions for reducing operation and maintenance costs. He suggested the lowering of insurance costs by a maintenance program to eliminate fire hazards. Hemenway (32) advocated the use of the maintenance employees to provide certain types of school equipment, such as cupboards, open shelves, and wall shelves; however, he cautioned against competition with efficient supply houses.

### **Rehabilitation**

Smith (79) reported the successful programs of rehabilitation of four counties of four southern states. He gave data on the extent of participation of WPA and PWA in school building construction. Nelson (30) made suggestions for rehabilitation of old buildings to eliminate fire hazards. McLain (55) suggested the appropriation of a definite percentage of the value of the plant for its renovation. Lewis (47) listed six categories of repairs and gave a program for summer renovation. Allen (3) advised the rehabilitation of the heating system at the close of the school year. Kirk (41) reported the use of PWA to good advantage in the modernization of old school buildings under seven categories. Gay (26) discussed the influence of WPA on school building standards, stressing safety, fire protection, and maintenance to prevent depreciation.

### **Maintenance of Grounds**

O'Brien (62) and Friswold (23) made suggestions for the maintenance of school grounds. O'Brien (62) listed eight items to be considered in

maintaining grounds. He stressed the importance and educational value of maintenance of grounds. Smith (80) believed that landscaping activities contributed to better citizenship. Long (51) discussed drainage, terracing, and landscaping of school grounds.

### **Equipment: Care and Handling**

Koopman (44) presented a plan for the management of school equipment covering items such as selection, financing, bidding, procedures, testing, storage, repair, insurance, and accounting. Burke (7) also presented a plan for the care of school equipment, not including built-in equipment, in which he advocated a permanent, continuing inventory. He considered a card inventory more flexible. Morphet (57) warned against the purchase of faddist equipment and suggested cooperative procedures for small schools. Hoff (36) made suggestions concerning selection of equipment. Ernst (20) stated that use or performance is the best method of testing supplies and equipment. He cautioned against being too specific in unimportant details of specifications. Lamb (45) discussed the use of both centrifugal and vertical pumps. Reagle (67) gave detailed instructions for the care of tools and machines preparatory to their storage for the summer. Band uniforms, musical instruments, and athletic equipment were included.

*Public Health Nursing* (72) asserted that the hazards arising from neglect of safety measures in schools may be as great as those in industry. Specific mention was made of manual training shops, faulty electric wiring, steam boilers, and safety valves. The St. Louis Survey (84) suggested the purchase of electric motor-driven scrubbing, polishing, and steel-wooling machines to simplify floor cleaning operations. Bursch (9) described inadequate buildings which were equipped with poor furniture and generally lacking in modern hygienic equipment. Deardorff (16) stated that improvements in plant equipment would improve educational results and advocated truly modern buildings and the alteration of existing poor buildings.

### **Depreciation and Obsolescence**

Poruben (65) made an analysis of the causes of depreciation of school properties. He gave three causes: (a) physical, (b) functional, and (c) contingent. He also listed five principles and gave procedures for computing depreciation and calculating annual depreciation allowances. Hermann (33) gave an illustration of the point at which obsolescence makes replacement justifiable or necessary. Adams (1) presented facts on the high cost of obsolescence of motors, plumbing, heating, and ventilating equipment.

### **Heating and Ventilating Systems: Operation**

Nelson (60) discussed heating and ventilating of the past fifty years. Vernon (90) gave an account of fifty years of temperature control in

school buildings. Davy (15) said that thermostatic control makes for an even distribution of steam throughout the building and a resultant saving in fuel. He discussed the relative merits of zone control versus room control.

Larson (46) stated that the fuel bill is affected by (a) construction of the building, (b) type of ventilating system, (c) temperature preferred, and (d) amount of air recirculated. He suggested, for economy, the stopping of ventilation as soon as classes are over. Lewis (48, 49) mentioned two methods of heating: (a) warm air and (b) transmitter. He found no great difference between the two systems as far as cost is concerned. He also discussed operation costs and provisions for maintenance of heating equipment. Kluever (43) reported a saving after changing from warm air to steam, and mentioned other advantages of steam over warm air. Daniels (13) gave suggestions for firing with anthracite and mentioned several advantages of anthracite over soft coal. Frostic (24) stated that cheap fuel is uneconomical. Pesterfield (64) stated that methods of firing are determined by the type of coal used. He mentioned the efficiency and economy of automatic stokers. The Pittsburgh Survey (83) advocated the purchase of stokers where local study indicated this to be an economical move; they advised the purchase of coal on a B. T. U. heat basis with premiums and penalties for deviations. Viles (91) discussed heating and ventilating systems, fuel and combustion, and methods of firing the furnace. Gillis (27) presented the arguments for oil burners in preference to coal but maintained that local conditions should determine the choice.

Scherer (74) suggested the location of the boiler plant away from the building as a safety measure and listed advantages of proper placement of equipment. Thode (88) advised the location of the boiler in an inconspicuous place, preferably in an area where the noise of coal deliveries would not disturb regular work. He also advocated provisions for expansion. Engineer (19) discussed the qualities of water best for the boiler, stating that "pure" water is advisable if available. Stevens (81) gave a plan for a thorough cleaning of the boiler room.

Schmidt (75, 76) and Hill (35) discussed the problems associated with ventilation and deplored the lack of adequate research in this field. Lewis (48) suggested a plan for low cost summer cooling. Brinkman (5) described the solution of a dust storm problem of ventilation by the use of unit ventilators.

### Painting

Clettenberg (11) stressed the importance of planning the painting program to prevent premature capital replacements. Kirk (42) and Sward (87) presented technical information concerning the choice of paints. Crawford (12) and Hayden (31), as well as Clettenberg (11), recognized the importance of color in the educative process. Moehlman (56) said that brightening up pays educational dividends. The importance of refinishing walls and ceilings and the choice of colors for light reflecting qualities

were mentioned by Dempsey (17). The St. Louis Survey (84) recommended the use of light shades of paint for ceilings to improve lighting conditions and the use of a greater variety of colors for interior decorations.

### Floor Care

Ethington (21, 22) advised the purchase of floor brushes of good workmanship. He said that the floor brush showed the difference between a custodian and a janitor. He gave suggestions for the purchase, use, and care of floor brushes, submitting photographs showing different uses of brushes in four successive stages of wear. Fulkerson (25) gave specifications for the construction of a dusting box for shaking a dry mop. He suggested a covered box mounted on castors. McConohay (53) advised the development of a formula for every operation in caring for floors. These formulas should be printed in a handbook. Viles (91) discussed daily floor cleaning. Longshore (52) emphasized the importance of reconditioning old floors. Adams (2) discussed the finishing of wood floors. Rubber mats and track walkers were suggested by McConohay (53) to lower cleaning costs during inclement weather. Special caution on the care of linoleum was given by Jarden (39). He stated that more linoleum floors are washed away than worn away.

### Cleaning

Several articles appeared outlining the duties of the custodian relative to cleaning operations. Grabarkiewicz (29) gave in detail the specific tasks in a summer work schedule. Suggestions were also given in editorials (77, 95). Rita (68) made suggestions for housekeeping. An editorial (78) on school plant management during the vacation period listed certain steps for summer cleaning. Viles (91) discussed housekeeping, cleaning duties, and general care of the school plant. Grabarkiewicz (28) gave a complete description of the steps in cleaning painted surfaces. He reported the use of wax on walls for lengthening the life of paint. He recommended the use of folding scaffolds for washing walls and ceilings. Walker (93) advised experimentation to determine the amount of cleaner needed in scrubbing walls.

Several suggestions were given by Davenport (14) for economizing in cleaning costs. He advocated the use of vacuum cleaners for efficiency and economy in cleaning; changes in working hours for better utilization of personnel; and the use of demonstrations and tests for improving the quality of work. Other changes which he reported as contributing to savings are as follows: (a) reduce "valet" service, (b) individual training of men, (c) replacement of older men with younger men, (d) reconditioning of floors, (e) use of portable vacuum cleaners in some buildings, and (f) introduction of a central delivery system. Brackett (4) mentioned several additional advantages of vacuum cleaning systems in schools, such as



the cleaning of chalkboards, library books, and boiler tubes. He gave suggestions for determining the capacity of the vacuum system needed for a given building. Grill (30) emphasized the importance of the teacher in maintaining sanitary conditions in the schoolroom.

### Sanitation

Scherer (73) stressed the importance of cleanliness and the responsibility of the board of education of efficient and sanitary plumbing. He also discussed artificial and natural light and their effect on sanitation. Rogers (71) discussed sanitary fixtures including showers, drinking fountains, and pools. Thompson (39) stressed the importance of clean toilets and gave a seven point toilet cleaning routine. Roberts (69) also discussed sanitation problems. Radder (66) advocated a thorough study of plumbing of each school building by master plumbers.

### Miscellaneous

Holy (38) stated that research in the following areas would lead to economy in maintenance and operation: (a) building construction; (b) heating, ventilation, and sanitation; (c) equipment for schools; (d) artificial lighting; and (e) management of school plant personnel. Susanka (86) discussed the difficulty of classifying expenditures as maintenance and operation and gave examples of variations in practices. Robertson (39) presented the advantages of a flat roof with suggestions for practical methods of repairs.

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## **PART IV**

### **CHAPTER XII**

#### **Relations of States to Local School Units<sup>1</sup>**

**T. J. TORMEY**

##### **Financial Controls by the State**

A DETAILED INQUIRY INTO THE REORGANIZATION of the governmental machinery for administering state financial affairs as it affects state higher education in each of the forty-eight states was reported by McNeely (16). He reported that, first, control over the appropriations before being made to the institutions by the state legislature is lodged in the governor, a budget board, or a commission through the establishment of state executive budgetary systems of one type or another in forty-seven of the forty-eight states. Second, control over the appropriations, after being made to institutions by the state legislature, has been conferred on the governor or state central executive agency through direct supervision or administration of their disbursements. There are a number of devices for effecting this type of fiscal control. Among them are (a) appropriation on a conditional basis with power vested in governor or agency to reduce the budget to avert deficit, (b) each institution being required to submit to the governor or agency prior to the beginning of each quarter of the fiscal year an itemized requisition or work program showing the amount of appropriations needed to carry on the work during the period. In this instance, the governor or agency is authorized either to approve or alter the amounts of the quarterly requisitions or work programs, together with individual items included in them. Third, the governor or agency is empowered to give prior approval or disapproval of all contracts, orders, or documents of the institution involving disbursements or incurring financial obligations against their appropriations. Fourth, approval or disapproval is likewise lodged in the governor or agency with respect to invoices, bills, or claims before payment out of the appropriations of the institution. Fifth, a continuous check is maintained of the disbursements of appropriations through periodical financial statements or reports. Sixth, the governor or agency is empowered to investigate the administration, operations, or activities of institutions with a view to reducing expenditures.

Haydis (12) studied state aid and control of public-school building projects with particular reference to four states. He stated, "There is no definite building fund policy for any major geographical section of the United States, and there is little similarity in purpose, bases for eligibility, and/or method of apportionment among the states having building funds."

<sup>1</sup> Bibliography for this chapter begins on page 239.

He set up four principles which should form the foundation of the state's control and of school building projects. Briefly stated they include (a) building aid as a part of an equalization program; (b) broad powers delegating control in a centralized executive staff; (c) state control exercised through a division of schoolhouse planning in a state department of education; (d) such division should be established with its broad powers indicated by law.

Control of school accounting exercised by state requirements and recommendations was studied by Martin (18). He found an enormous lag between theory and practice in school accounting. He found, further, that almost complete agreement existed as to the underlying principles of school accounting as evidenced by the response of public-school business officials, state department officials, and professors of school administration to the twenty basic principles enumerated.

### **Building Codes for States**

School plant standards for rural and elementary schools were studied by Kennerly (14) to determine the varying degrees of emphasis placed upon various phases of the school plant by different regions of the United States. Nineteen states offered "nothing in the way of a definite building plan and no effort is being made by these 19 states to set up a definite or detailed list of materials to be used in the construction of rural school buildings." Stewart (21) studied state school codes "to show what various states have to offer in the way of schoolhouse building codes or laws." School laws of thirty-five states make provision for the approval of building plans and specifications of the school building; seven states provide that after the final approval of plans and specifications there may be no changes or alterations unless the desired changes are shown on the new drawings.

Bostick (1) studied conformity of practice, as revealed by blueprints, with the school building law in Texas. He found that 75 percent of the one-story group conformed while but 57 percent of those having more than one story conformed. Dickinson (9) and Turner (25) proposed school building codes for Arizona. Herber (13) reported a study of the Public Works Administration as applied to school buildings in New York State. Dersham (8) gave a detailed report of steps taken in the construction of a school building under PWA loan and grant. As part of a series of publications, Stoneman and Broady (22) presented supplementary standards for the small twelve-grade building. The "small school" refers to schools enrolling 200 or fewer in the elementary grades and 150 or fewer in the secondary school.

### **Reorganization of Local School Districts**

Reorganization studies in Ohio were made by McCowen (15), Freshcorn (11), Teets (23), and Porter (20). Martin (19) studied the school organization in a county in Michigan using the criterion of natural centers where



larger units for educational purposes might be established more nearly to equalize opportunity. This study is but one in a series of Michigan studies which later will be summarized in a master study for the state. Joint high schools for the small towns of Connecticut were investigated by Maddocks (17). He recommended that (a) the minimum enrolment for a joint high school be 250; (b) the state board of education should designate the joint districts and locate the joint schools after careful survey; (c) each such high school should include at least four of the upper six years of schoolwork.

The state of Washington (28) has given consideration to the reorganization of school districts, strengthening the county and state educational administrative machinery, and an expansion of school services. A monograph by Breckner (26) described the plan under which the current operating revenues are raised and distributed. Breckner (2) later reported on the history, activities, accomplishments, and problems of the school district reorganization. The proposed reorganization of Kitsap County was next reported by Breckner (3), followed later by reports (4, 5) on several other districts, and a progress report (27). Thurster (24) reported that eighteen states have completed or initiated statewide surveys of school building needs. Covert (6) reported that approximately 55 percent of the funds used by the public schools of West Virginia came from statewide sources in 1937-38. Covert (7) also reported on the projected school building program for Pennsylvania.

Zook (29) stated that the published report on public institutions of higher education in Utah was influential in the shaping of some legislative proposals for reorganization of the state higher educational facilities in educational institutions. Zook also said that the Committee on Government and Educational Finance had developed plans for the publication of profile charts to indicate the level of public-school financial support and that plans are being made to secure similar data for the institutions of higher education.

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## CHAPTER XIII

### Court Decisions in the School Plant Field<sup>1</sup>

S. M. BROWNELL and M. M. SCHWARZ

STUDIES BASED ON COURT DECISIONS in reference to the planning and construction of buildings were reviewed in Chapter V. Other legal research in the school plant field has been concerned with (a) tort liability and negligence, (b) use of property and school funds for purchase of property, (c) tax exemption and other aids to private schools, (d) title of property, (e) effect of alteration of school districts, (f) insurance, (g) abandonment and reversion of real property to the grantor, and (h) college and university property.

Chambers (8) has reviewed some eighty-eight studies of legislation and court decisions in the school finance and business administration field, which included the bulk of the legal problems arising in and about the school plant. An annual review of court decisions, classified and arranged under convenient headings, may be found in the *Yearbooks of School Law*, which he edits. Less complete reviews of current decisions are published, from time to time, in the section on school law in the *American School Board Journal*. While many studies have been produced in the past three years which have brought up to date the report of the decisions on one question or another, the most comprehensive research in the general field is still Punke's work (43) published in 1936. Although the law could never be called static, most of the principles and trends determined by him have been reaffirmed.

#### Tort Liability and Negligence

Rosenfield's book, *Liability for School Accidents* (48), is based upon more than 450 references to court cases, opinions of attorney generals, and legislative acts. It is a thorough study of negligence in law as applied to school cases. In dealing with the specialized cases of school accidents, it includes accidents that are due to building, grounds, and equipment condition or usage. It emphasizes the questions involved and the findings rather than analyzing a large number of cases individually. Hamilton (25) and Hodgdon (28), in their case and problem books on school law, consider tort liability and negligence including cases from the school plant field. Studies by Fuller (21), Foley (19), and by Fuller and Casner (22) analyzed and evaluated the theory and practical results of tort liability and negligence as applied to public-school districts, officers, and employees in the United States. Using the historical approach largely in his study, Fuller (21) concluded that immunity of school districts from ordinary liability for the tortious acts of its officers, agents, and employees is un-

<sup>1</sup> Bibliography for this chapter begins on page 250.

justified. He presented legal theories and compared the experience of states which maintain the immunity with that of those where school districts are liable for torts. He noted that in nearly all states tort liability has been enforced for a few classes of torts such as those involving trespass, nuisances that damage real property, and assumption of liability for negligently operated school buses.<sup>2</sup> He concluded that statutes making school districts liable could well be framed along the line of those operating in California since 1932. Possible amendments would define upper limits of recovery in cases of disaster, and would extend liability to torts other than negligence. He argued that since the primary purpose of tort liability is to provide strong incentives for the prevention of negligent accidents and other tortious harms, and that a secondary purpose is to compensate victims of tortious acts when they are themselves free of legal fault it is unwise to eliminate the personal responsibility of school employees by insurance or statute. Self-insurance by large school districts and a state insurance fund for small districts would seem wise to him.

Foley (19), who likewise analyzed the court decisions and legal theories involved, pointed out the nonliability of school districts generally, but noted exceptions, chiefly in New York, California, and Washington, where statutes permit suits against the school district. He, too, concluded that the present situation is unjust and that the remedy lies through legislation rather than through the courts. Unlike Fuller, however, he would broaden workmen's compensation as a possible remedy of the situation. Fuller and Casner (22) examined the principle of municipal immunity, subjected several legal theories to criticism, and recommended (a) the acceptance by courts of the rule of complete liability of municipalities for tort, and (b) that damages be confined to the monetary damages actually sustained. Higgins (27: 164-66) examined and analyzed all the reports of the decisions of the New York Court of Appeals and the Appellate Division of the Supreme Court from 1848 to 1936. From these he derived forty-five principles controlling the common school. Three of these summarized rules of liability of school districts, officers, and employees for torts and negligence as generally found in New York State.

The use of insurance by public schools as a protection against damage awards is pointed out by Harmon (26: 14). Blackwell (2: 99-105) showed the conflicting decisions of courts in cases involving colleges and universities and pointed out that insurance companies will include a clause in contracts to the effect that they will not avail themselves of the defense that the insured is an educational institution without the written consent of the insured. Chambers' review (14) of court cases of the previous year (1937-38) involving colleges and universities includes some which hold the institutions liable and some holding them immune.

Reports of cases involving tort liability and negligence in connection with the school plant are provided in the *American School Board Journal*

<sup>2</sup> Liability in connection with buses or other than the school plant is not considered in this review.

(1), the *Yearbooks of School Law* (12: 155-57; 37: 103-109; 38: 92-96; 39: 79-86; 44: 94-95; 54: 83-84), and *Clearing House* (30). Hodgdon, during 1938-1939, presented nine articles on tort liability in *Clearing House*. They were based upon principles of law, problems in the field, and court decisions. His point of view of the inequity of the present rule of nonliability of school districts is in general agreement with that of Fuller and Foley. In the December 1940 issue (30), he stated in one paragraph answers to these questions: (a) May boards of education insure teachers against liability? (b) May the legislature pass a statute to give the board power to insure teachers? (c) May boards of education be made liable for the negligence of teachers? (d) May the legislature relieve teachers from liability of negligence? The general answer, with qualifications, seemed to be "no" in each case.

### Use of Property and School Funds for Property

Kindred (36) and Pizor (42) studied statutes, court decisions, and constitutional provisions relating to the use of public funds for private and parochial schools. Pizor organized his findings on a state by state basis, since the constitutions and laws vary from state to state. The conclusions reached by both studies are in general agreement that the courts are divided on whether public-school property may be used for other than school purposes without express statutory permission, and that recent decisions show a tendency to recognize the schools as centers of community life. These conclusions are consistent with the decisions reviewed in other studies; for example, a school cannot loan library or laboratory equipment permanently to a private junior college (32: 148-49; 55: 71-72); a school can lease its grounds to a ball club provided this does not interfere with the operation of the school (17:76; 46: 64-65); a school may be used for public dances and community recreation (25: 104-10; 42: 100-101); and if the statutes permit community use of a building, a school-board may permit or refuse the use for religious, lodge, or commercial purposes which do not interfere with the operation of the school program (42: 115). Kindred and Pizor also considered the variation in court rulings concerning whether public funds may be used for rental of church school property for school use, concluding that generally this was illegal, unless it could be shown that these were the best or only available premises (36; 42: 163; 57: 96-97). An exception to this general ruling is cited and the entire problem is discussed in a study appearing in the *Yale Law Journal* entitled "Catholic Schools and Public Money" (58).

Reports of court actions concerning the power of the board of education in management and disposal of school property indicated that decisions were closely dependent upon the statutes. They affirmed in the several cases that a schoolboard was empowered to convey properties (1, July 1940: 58; 29: 299-302; 46: 67-68); raze a school (1, July 1940: 58; 46: 66-67); abandon or reopen a school (50: 57; 34: 72-73); lease it to an

oil company (55: 73-74); or conduct school for Negroes in a building formerly used for white children (54: 83).

The courts also decided that proceeds from the sale of a building should be used to retire outstanding bonds of the building and not to make additions and improvements to other buildings (1, June 1940: 60; 41: 87); that money from sale of a high school could not be used by the elementary-school districts which it embraced (55: 74); that money raised for retirement of bonds could only be used for another purpose by vote of the people (41: 90); that the use of surplus from a bond retirement tax was a discretionary power of the board (41: 90-91); and that under certain conditions the board may transfer money from the sinking fund to the operating fund (36: 124).

Statutes requiring an action by the voters before school sites may be purchased or disposed are common. A majority vote is often stipulated by these statutes to authorize the act by school officials. An interpretation of such a statute by an Oklahoma court was reported by Weltzin (54). The statute was so construed by the court that the contemplated act could be authorized by a majority of only the electors voting rather than an approving vote of a majority of all qualified electors in the area. Punke (46) digested an Oregon case in which the court said that a district may have as many schoolhouses and sites as it desired, in answer to an allegation that a majority vote could not grant authority to select a new site and build a new school in a district which already had a school. A taxpayer's suit, to enjoin the construction of a high-school building on a plot larger than the board was authorized by statute to acquire, was tried before an Iowa court (55). The school corporation's title was held valid as to that part of the plot within the size authorized by the statute.

Keesecker (33) cited a Montana case in which the court ruled that it has no power to control the decision of a schoolboard as to whether it will conduct a school or send pupils elsewhere, in a particular way, but the court will compel the board to exercise its discretionary function. Thus a schoolboard, having exercised its discretion to close the school, must then exercise another discretion by determining whether it would provide the children in the district with transportation or board and rent, and, in any circumstance, tuition while attending school in another district. Faced with inadequate facilities, school directors have commonly adopted the practical measure of either renting or partially maintaining quarters in either a private or sectarian school building, and conducting therein a public school. Courts in interpreting the legality of such action have reached conflicting results (32: 146-47). Iowa and Kentucky courts ruled that the arrangement practically turned the public school into a sectarian school and enjoined its continuance. A Wisconsin court permitted the rental of rooms in a parochial school, where a statute conferred power upon the public-school directors to buy or lease a site for school purposes. An Illinois court reached a similar conclusion without such an enabling



statute. Chambers (13: 61), in summarizing cases in this category, observed that although the decisions are somewhat in conflict high judicial pronouncements are making important contributions to continuous working out of a solution whereby educational opportunity and religious liberty can be preserved under varying situations. The most thorough studies of public-parochial relationships have been produced by Kindred (34, 35, 36).

Title to school property is generally vested in the state and said property is held in trust for the state by the local school district. An Oklahoma statute (54: 83) provided that cities holding title to property purchased for school purposes should transfer it to the local boards of education, when requested by the latter. Under this act, Oklahoma City was ordered to comply with a request of the board of education to turn over to it the title to property obtained by the city through a federal grant. Chambers (15) reviewed the New York exception to the general rule, where if the board requires property for legitimate use, title must be taken in the name of the city, unless boundaries of the city and the school district are not coterminous.

The question of relief for a vendor, when an illegal procedure had been followed, so that notes and a mortgage issued in payment for school property were declared void, was decided by a Florida court (54: 82). This court ruled that if the district, whose improper procedures resulted in the impasse, does not wish to lose its property, it must pay the sellers what is equitably due them. Punke (46) summarized an Oregon case in which the right of school officials to sell and convey property hinged upon the subsequent use to be made of the property. Districts could transfer property only when the property continued to be used for public purposes. Failure of a county to make use of property more than seven years subsequent to the execution of the deed by the school district entitled the district to reconveyance of the land. A Montana county treasurer (55) was ordered to deposit funds derived from the sale of a high-school building to the credit of the high school, rather than distributing the funds among the various schools of the county as originally planned.

Although personnel problems cannot be touched here, a contribution by Chambers (11) is worthy of mention. This covered, in some detail, the legal problems and the employment status of school janitors, a question of importance in the maintenance of the school plant.

Courts are granting more freedom to the schoolboard in determining the use to which the school plant may be put; and in discretionary matters they will not disturb the board's determinations, in the absence of abuse. The authority of a schoolboard to rent athletic fields to a local ball club was upheld by an Idaho court (46: 64-65). This court, in rejecting the complaint, said that it is an almost universal rule that leasing of school buildings and parks for private purposes, which are not inconsistent with the conduct of the school, is not an unconstitutional use of such property. An Illinois high-school board, however, was enjoined from fulfilling an agreement with a private junior college, which provided that certain of

the high-school facilities were to be used jointly by the students of the public high school and a private junior college by means of a kind of loan (16, 32, 55: 71). After weighing the leading cases dealing with collateral use of school property, Pizor (42) found that the main criterion applied by the courts is clear and concise evidence that a public purpose is being served and that such use is in accordance with the fundamental principles of American government. Another pertinent point in the use of the school plant was emphasized by Chambers (6, 9) and Keesecker (33). Their studies of decisions showed the limitations on educational opportunity open to rural youth, for in many instances the small and remote high school is the only school open to free attendance by pupils who live nearer to larger and better ones.

### **Tax Exemption and Other Aids to Private and Sectarian Schools**

A study by Kearney (32) reviewed court decisions and considered three forms of aid to private and sectarian schools: (a) nonfinancial aid, such as prohibiting objectionable businesses near a school, traffic regulation, compulsory attendance, and credit regulations; (b) financial aid, such as tax exemption, payment of student tuition, rental or maintenance of a building, loan of library or other equipment, and free water; and (c) indirect aid through aid to students, transportation, and textbooks. Pizor (42: 67) also made brief mention of tax exemption as a form of state aid to private and parochial education. As particularly applied to the school plant, the recent court decisions upheld tax exemption of a private college and a business college (12: 152-53; 14: 91-92; 52: 134-35); declared municipal housing projects to be public property and tax exempt (45: 80-81); but refused to exempt fraternity houses from taxation (12: 153; 14: 93; 52: 134); or to exempt personal property in a house rented by a school from a private owner (52: 134). It was also decided that charter exemption from taxes could be voided by legislation without violating Article X of the United States Constitution (which forbids a law impairing the obligation of a contract) holding that taxing power cannot be irrevocably exempted; otherwise it would destroy a power which there is no legislative power to destroy (52: 132-34). A bequest to an educational institution was not exempt from state inheritance tax (52: 135; 55: 73).

### **Title of Property**

Although no special studies were conducted concerning the problem, several cases came before the bar questioning the title to school property. In these cases, the courts decided that property which contains the specific condition in its title that the property is granted only so long as it shall be used for educational or school purposes reverts to the owner or his heirs upon discontinuance of that usage, but not otherwise (46: 68-69; 54: 82-83; 55: 71); that "educational purposes" in the instance at bar meant school use and not general educational purposes (46: 70); that

if a total site is larger than permitted by statute, title remains valid to the school district for that part of the land within statutory size (55: 70); that negligence by the party granting a title does not invalidate a title to a school district (55: 70); and that a school district received title by adverse possession to property granted by a life tenant (46: 63).

### **Effect of Alteration of District Boundaries on the School Plant**

How consolidation of districts changes the relation of a school district to school property was brought before the courts in several cases during the past three years. It was decided in two cases that the whole of the new district was responsible for the bonded debt of the two original districts (23: April 1939, 53; 25: 18-19); while in another instance it was held that consolidation did not relieve the original district for its bonded debt (20: 114). In a suit to determine whether property might revert to a conditional grantor the court decided that the formation of a union district did not constitute abandonment of a site by the school district (46: 71).

### **Insurance**

Gruelle (24: 19-50) reviewed the legal status of insurance on public-school property, with special reference to Kentucky; compared insurance laws of states having some form of self-insurance; and made a special study of the Kentucky school insurance problem. By citing court decisions, he concluded that boards of education in most states may insure property, even without explicit statutory authorization (24: 21-32). The court's judgment concerning an unusual insurance problem was presented in the opinion and dissenting opinion of an Oklahoma case. It was held that a company must pay an insurance loss although the premium was on a credit basis which violated the constitutional prohibition against indebtedness beyond current revenues and although there were no written minutes of the meeting at which the insurance was contracted (1: Nov. 1939, 62; 55: 74).

The weight of judicial authority seems to permit insurance as a part of the general power of school officers to manage and care for school property (24, 43: 232). The amount for which buildings shall be insured, or the casualties against which insurance is taken, are matters within the discretion of school officials, unless a statute specifically provides otherwise (43: 238). A recent adjudication by an Oklahoma court (55: 74) concerned insurance premiums on credit. A school district, being without funds with which to pay premiums for fire insurance, obtained policies on a credit basis. When the property burned, the insurance company sought to avoid its liability by alleging that the contracts violated the Oklahoma constitution prohibiting indebtedness in excess of income and revenue for the fiscal year. The court held the contracts valid, reasoning that the obligation rested on the company to discover the limitations of authority of the schoolboard, and that if the company could not recover against the

board, it might do so against its individual members. A strong dissent, which is probably the better law, condemns the majority opinion as enforcing violation of the constitution through upholding a clearly illegal contract. The Illinois appellate court ruled that the schoolboard could not be held liable, even for the reasonable value of insurance, when the contract agreement was made informally, and none of the minutes showed the vote on the transaction as required by statute (50: 59). One of the conclusions of Gruelle's study of insurance (24) was that a board of education in Kentucky may not become a director in a mutual company, but there was no reason why it would not be eligible as a member.

The question most frequently raised concerns the right of the schoolboard to purchase insurance to protect it from liability, to which under the common law it is not subject. Remmlein (47) and Rosenfield (48: 133) concluded that there is a growing number of states which permit liability insurance to cover damages resulting from negligent operation of school buses. Washington, New York, and California permit liability insurance to cover district liability for accidents because of the removal of common law immunity in certain tort actions. Joyner (31: 48) found that in Alabama and Georgia insurance companies were not held liable, even though negligence was proved and the district carried automobile liability insurance. Courts in Tennessee and Texas, however, held that if the district carried liability insurance on its vehicles the insurance company or the district could not raise the defense of immunity in performing a governmental function. It may be that legislatures are slow to enact mandatory insurance legislation for schoolboards since that would appear to acknowledge the district's liability, which to date has, with few exceptions, been denied (47: 100). Dice (18) recommended that districts be compelled to assume liability for the negligence of their agents and to carry insurance covering that liability. A factual analysis was made by Fuller (21) on the operation of tort law, workmen's compensation, and insurance in widely scattered American cities where school districts are liable in tort. He decided that self-insurance is preferable to commercial public liability insurance for large districts and is far less expensive. Provisions for smaller districts should be made through established state funds.

### **Reversion to the Grantor**

Deeds, which provide for the use of real property for school sites only, are a fertile field for litigation. Courts in the public interest make every effort to prevent reversion, but where the reversionary clause is unmistakable they are forced to follow the terms of the agreement. The language of a deed which stated that ". . . said lands to be occupied for the purpose of a schoolhouse and for no other purpose whatever," and, "to have and to hold the same to the only proper use of said board of education . . . so long as the same shall be occupied as a site for a school," was held by an Ohio court to provide for a reverter and forfeiture. When the

district attempted to sell, it reverted to the heirs of the original grantor (54: 82). An Iowa court permitted a college to sell property when the instrument of conveyance used these words: ". . . said land to be used for educational purposes and religious purposes only" (54: 83). A New York dispute (46: 68) also related to whether a deed adequately provided for reversion. The deed recited that the grantors "bargained and sold" said land "for the site of a schoolhouse and for the length of time only which it shall be occupied for that purpose." The court held that "the school district would lose the right of possession if the maintenance of a school on the site was permanently discontinued." Further decisions on reversionary interests were summarized by Punke (46) and Weltzin (54, 55).

A North Carolina district (55: 71) had not abandoned a school so as to vest the heirs of the grantor with title to the property, when it offered said property for sale, took bids, then rescinded the plan to sell and again used the property for school purposes.

### College and University Plants

Court decisions relating to colleges and universities have been reviewed by Chambers (7, 10, 14) annually for the past three years. Brody (3, 4, 5) contributed digests of cases concerning tax supported institutions of higher learning; Weaver (51, 52, 53) and Chambers (13) digested cases arising in colleges under private control. A decision by the United States Supreme Court that a state institution must collect and pay the federal tax on admissions to football games has important implications in the use of the plant. The reasoning of the court, as reported by Brody (3: 145), holds that the conduct of exhibition games is not a function of the state government but remains an essentially commercial enterprise, and the private character of such enterprise is unaffected by the fact that the state may use such means to support a governmental function such as higher education.

Chambers' summaries of trends (7, 10, 14) are supported by other contributors to this topic. The trends discerned by Chamber (14: 95) in 1939 were:

1. Closer scrutiny of tax exemptions with occasional restrictions thereof, especially in the field of tax exemptions and in taxation of accessory educational corporations such as fraternities and the like;
2. Modification of the doctrine of complete immunity from liability for torts, when the innocent injured party would be left without a remedy;
3. Attention to demands of Negroes in southern and border states for equal opportunity for graduate and higher education;
4. Tolerant and receptive attitude toward new plans for financing buildings in cooperation with other agencies, whether federal government, local public school districts or private non-profit lending corporations; and
5. Continued favor toward educational trusts.

The 1940 summary by Chambers (7: 87) showed that no trends in the 1939 report were reversed and some were accentuated. Three more decisions



sustaining self-liquidating plans for financing buildings at state institutions were reviewed. Two cases in which colleges have been held liable in torts, one in a state and one in a privately controlled institution, would seem to indicate that the old doctrine of immunity from tort liability was being softened (7: 76; 51). In his latest report, Chambers (10: 108) noted an absence of litigation concerning financing and construction of buildings and tort liability in colleges.

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